DOCUMENT RESUME

ED 408 164 SE 060 236

AUTHOR	Denoya, Laila E., Ed.; And Others
TITLE	The National Science Foundation Summer Science Camps: Leaving a Legacy of Successes.
INSTITUTION	National Science Foundation, Arlington, VA. Directorate for Education and Human Resources.
PUB DATE	97
NOTE	211p.; Photographs may not reproduce well.
CONTRACT	HRD-9601978
AVAILABLE FROM	National Science Foundation, Directorate of Education and Human Resources, 4201 Wilson Blvd., Arlington, VA 22230.
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	Calculus; *Career Awareness; Computer Uses in Education; Educational Strategies; Elementary Secondary Education; Field Trips; Graphing Calculators; Hands on Science; Interdisciplinary Approach; Mathematics Activities; Mathematics Instruction; Science Activities; *Summer Science Programs; Technology
IDENTIFIERS	National Science Foundation

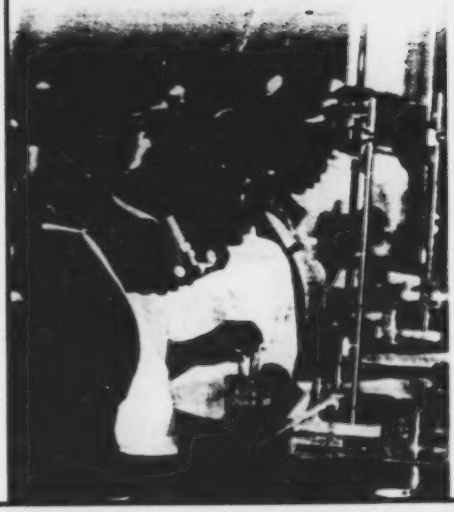
ABSTRACT

This book contains descriptions of the 122 Summer Science Camps (SSC) funded by the National Science Foundation (NSF) from 1992 to 1996. This program is employed as an early intervention strategy that reaches out to a large number of disadvantaged children who are underrepresented in scientific and technical careers. The main goal of the SSC is to enable students to develop a lifelong interest in science and mathematics and to encourage the consideration of science, mathematics, engineering, and technology as possible career choices. This book describes the legacy of successes of these SSCs which are no longer funded by NSF. The successful programs are listed in alphabetical order by state. The camps engage young participants in the process of learning by doing, encourage students to think of mathematics and science as disciplines connected with their lives and communities, and construct experiences that promote uniquely personal scientific knowledge. (DDR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL
HAS BEEN GRANTED BY
L.E. Deroya
THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

ED 408 164



NATIONAL • SCIENCE • FOUNDATION

The National Science Foundation

SUMMER SCIENCE CAMPS

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Leaving a Legacy of Successes

BEST COPY AVAILABLE

BOOK STAFF

LAILA E. DENOYA, Ph. D.
Executive Editor
SSC Principal Investigator
Director of Upward Bound Program
State University of New York College at Fredonia, New York

KERSTIN CRINNIN
Assistant Editor
Jamestown Community College, New York

ARMY LESTER III, Ph. D.
Contributing Editor
SSC Principal Investigator
Kennesaw State University, Georgia

JOSEPH W. SCHWABENBAUER
Vice President of Sales
Seneca Printing & Label, Inc.

ROBERT DEWOODY
Production Coordinator
Seneca Printing & Label, Inc.

R. PAUL KINSMAN
Graphic Designer
Seneca Printing & Label, Inc.

This book is published by **Seneca Printing & Label, Inc.,** recipient of **ISO 9002 certification,** the international business community's highest standard for quality, located at Sandycreek Industrial Park, DeBence Drive, Franklin, PA 16323. Phone: **1-800-372-1313.**

This publication was supported by a grant from the National Science Foundation, Directorate of Education and Human Resources, Division of Human Resource Development (HRD) (grant #HRD-9601978). The views expressed in this book are those of the authors; they do not necessarily reflect those of their institutions, agencies, or the Foundation. The editors assume full responsibility for any errors that remain.
All rights are reserved by the Summer Science Camps' principal investigators.

Table of Contents

Special Dedication 2

What Who Where How? 3

What is a Summer Science Camp? 4

Who are we? 6

Where are we? 8

How do we achieve our goals? 10

Summer Science Camp Sponsors 14

Let me tell you who I am 15

Summer Science Camp Program Descriptions 16

Communicating with "Camp Talk" 200

Summer Science Camp Directory 201

Special Dedication

The Summer Science Camp investigators would like to dedicate this book to the following outstanding individuals at the National Science Foundation:

DR. LUTHER S. WILLIAMS
Assistant Director
Directorate for Education and Human Resources

DR. ROOSEVELT CALBERT
Division Director
Division of Human Resource Development

DR. BETTY RUTH JONES
Senior Program Director
Precollege Programs
Division of Human Resource Development

DR. COSTELLO L. BROWN
Former Senior Program Director
Precollege Programs
Division of Human Resource Development

DR. WANDA WARD
Former Senior Program Director
Precollege Programs
Division of Human Resource Development

Dear Summer Science Camp Investigators: Congratulations to you, your staff and students for an outstanding job well done!! This book represents a legacy worth saving and sharing. It is a significant resource guide that highlights effective strategies and models of more than a hundred successful science camps throughout this country which were designed to provide a foundation and encourage precollege students to consider careers in science, mathematics, engineering and technology. We hope this book will become a reference guide to a broad-based audience of educators, policymakers, communities, corporations, industries, and activists who are working to increase access to all for careers in SMET. Again congratulations and we thank you for your dedication.

Sincerely,

Dr. Betty Ruth Jones

Dr. Betty Ruth Jones
Senior Program Director
Precollege Programs
National Science Foundation

ACKNOWLEDGEMENTS

Special thanks are due nationwide to the 122 Principal Investigators and Project Directors of the Summer Science Camps. Their collective energies have made this project an enriching and intellectually rewarding experience.

A very special recognition is given to **Dr. Betty Ruth Jones,** Senior Program Director, Precollege Programs, Division of Human Resource Development (HRD), National Science Foundation, whose professional vision and support in education, especially sciences education, commendably encouraged us to make this book a reality. Thank you.

Appreciation is extended to **Mrs. Kerstin Crinnin,** Assistant Editor, and **Dr. Army Lester III,** Contributing Editor. Without their assistance this book would have been difficult to complete. Many thanks.

Deep gratitude goes to **Dr. Luther S. Williams,** Assistant Director, Directorate for Education and Human Resources, and **Dr. Roosevelt Calbert,** Division Director, Division of Human Resource Development (HRD), National Science Foundation. Their views on educating the next generation in the fields of mathematics, sciences, and technology surpass the limits of what is needed for the education of tomorrow's scientists and engineers. Our most sincere thanks for being visionary leaders for our country.

BEST COPY AVAILABLE

What? Who? Where? How?

Nationwide, bright minds came together from their diverse educational and scientific arenas to offer and share their experiences with their National Science Foundation (NSF) funded Summer Science Camps (SSC) as the successful early intervention strategy of reaching out to a large number of disadvantaged children who are under represented in scientific and technical careers. These SSC Principal Investigators made this early intervention strategy their first priority in their quest for educating the next generation, and requested funding from primarily the NSF to implement the SSC as an educational tool.

There is compelling evidence that the achievement gap in mathematics is still a major problem in the United States of America. In a recent report by the National Center for Statistics, preliminary findings indicate that: "...The U.S. is far from being among the top nations of the world in Math and Sciences."[1] The proportion of students who are qualified to select math, science and technology fields grows smaller each year as they progress through the precollege education system.

The NSF has taken on an aggressive role in ensuring the vitality of the U.S.A. in the scientific and technical enterprise by providing leadership and support for the nation's efforts to improve scientific literacy. Primary responsibility for the NSF's educational activities, precollege education being one of them, is assumed by the Directorate for Education and Human Resources (EHR), supported by the Division of Human Resource Development (HRD) under the Career Access Program, to increase the representation of disadvantaged students in sciences, engineering, mathematics, and technology (SMET) at all levels. The SSC became an initiative program addressing the precollege education level, particularly middle school grades (grades 7-9).

The main goal of the SSC is "to provide a foundation for a lifelong interest in science and mathematics for all participants and to encourage the consideration of SMET as possible career choices."[2] A total of 122 SSC were funded nationwide by the NSF from 1992 to 1996, engaging the young participants in the process of learning by doing, encouraging them to begin to think of math and science as disciplines connected with their lives and communities, constructing experiences that yield toward uniquely personal scientific knowledge with a sense of continuity for math and sciences to form a seamless fabric of learning from early school years through graduate study and research. Now, there is a strong need for disseminating the SSC results in order to be accountable to the NSF and taxpayers as our stockholders.

This book is the first and only comprehensive report to describe all 122 NSF/SSC, which have been discontinued in their funding by the NSF. Currently, other comprehensive NSF school programs include summer science and math enrichment activities as part of their educational efforts. Yet, the NSF funded Summer Science Camps are ***Leaving a Legacy of Successes*** as presented in this book.

Dr. Laila E. Denoya
Summer Science Camps
Principal Investigator
State University of New York College at Fredonia

1) U. S. Department of Education, National Center for Education Statistics, Pursuing Excellence, Washington, D. C.: U.S. Government Printing Office, 1996, p. 69
2) National Science Foundation: Human Resource Development For Minorities in Science and Engineering: Program Guidelines, Arlington, VA, 1994, p. 6.

NATIONAL SCIENCE FOUNDATION GUIDELINES FOR PRECOLLEGE FOCUS SUMMER SCIENCE CAMP PROGRAMS [SSC]

The projects highlighted in this publication were selected using the following guidelines as described in NSF 94-122 which replaced NSF 92-111.

I. INTRODUCTION

Underrepresented students drop out of school in significant numbers as early as seventh grade before the formal study of science and mathematics begins. Of those who persist, many enter high school lacking an interest in science, mathematics, engineering, or technology (SMET) careers and subsequently, do not take the key prerequisite courses for a college major in these disciplines. Further, science and mathematics courses are often viewed by these disadvantaged, underrepresented students as irrelevant to their daily lives or future occupations. Within the context of the increasing number of occupations that require a knowledge of science and mathematics and the predicted increase in the underrepresented student population, serious questions are raised regarding the ability of our precollege system to address the needs of these students. Without activities that influence the attitudes of underrepresented students toward staying in school and continuing the study of science and mathematics, a significant percentage of these students will not be prepared to become full participants of the nation's science and engineering workforce.

The Summer Science Camp (SSC) is one of two activities under the Career Access Program. This activity is designed to increase student interest in and exposure to science and mathematics. The program targets middle school years where students begin the crucial study of science and mathematics and begin to explore career options.

II. GOALS AND OBJECTIVES

The goals of Summer Science Camps are to provide a foundation for a lifelong interest in science and mathematics for all participants and to encourage the consideration of science, mathematics, engineering, and technology (SMET) as possible career choices. Specific objectives include:

- strengthening student commitment to remain in school and continue the study of science and mathematics;
- illustrating the importance of science, mathematics, and communication skills in our daily lives;
- exposing students to a broad range of participatory activities in science, mathematics, and technology including the research process and interactions with practicing scientists, engineers, and mathematicians;
- offering students information and guidance in the career exploration process including the academic preparation necessary for a variety of professions; and
- heightening student awareness of science and mathematics disciplines as potential career choices, including attention to precollege level.

III. ELIGIBILITY

Organizations eligible to submit SSC proposals include school districts, museums, colleges and universities and non-profit youth-centered and/or community-based organizations. In general, any organization which has education as a major focus and has significant experience in providing educational activities for precollege students will be considered. Profit making industries with educational programs for this age group are also eligible to apply. An organization is eligible to submit one proposal per funding period. In addition, an institution can only have one active award.

IV. PROJECT DESIGN

Proposals should focus on providing experiences and opportunities that introduce underrepresented students to the excitement and challenge of science, engineering, mathematics, and technology careers. Activities may include classroom and hands-on experiences that provide for an integrated study of science, engineering, mathematics, and technology within the natural environment; expanded counseling regarding career opportunities in these disciplines; interaction with role models in these fields; and activities that strengthen family and peer support for student interest in these areas. Projects should be structured to promote group

identity and support informal interaction between participants, staff, and scientists.

Activities

In general, proposed activities should seek to augment the secondary school curriculum. Within this framework, the SSC activity seeks innovative approaches to providing enrichment experiences for young students including instruction, problem solving and communication skills, and exposure to the research process. Categories of eligible activities include:

Instructional Activities - When limited course work in mathematics and/or science is a characteristic of the group as a whole, the teaching of science and mathematics concepts should be included. Instruction in verbal and written communication skills as they relate to science and mathematics should also be included. Advanced course work may be proposed, where appropriate for the selected population. These activities should not duplicate or replace the school curriculum.

Research Methodology - The Summer Science Camp activity should provide a forum that enables students to experience the excitement of "doing science" in the disciplines chosen. However, individual research projects may be less appropriate for students in these grade levels.

Career exploration - The SSC activity places a strong emphasis on career exploration. Thus, activities should include interactions with scientists and science educators in a variety of potential work settings. Discussions of higher education options and costs, with particular attention to options for financial assistance, are required. Attention to cultural/social barriers to student entry into SMET careers should be integrated throughout planned activities.

Mentors - A variety of small group activities that strengthen the role of scientists and engineers as mentors for students is required and should be an integral part of summer and academic year activities. Individual mentors including undergraduate and graduate students are encouraged. Where appropriate, activities should include participant interaction with scientists in the workplace.

Student Support - Activities should be included that strengthen family and peer support for student interest in education and increase student confidence in their academic abilities.

Follow-up activities - To maintain the interest of students in science, especially those who attend schools with a limited focus on science and mathematics, innovative and creative follow-up activities during the school year should be included.

Discipline Focus

In order to allow students to explore their interests in more than one discipline within the targeted fields, proposals that include attention to mathematics, science skills and their applications are encouraged.

Project Site/Length

While the term "camp" is chosen because it suggests informal student activities and outdoor environments, it is not intended to limit project sites. Projects funded through this program can be up to six weeks in duration, but those offering at least four weeks are likely to provide more in-depth exposure. Students may participate in subsequent years of a project.

Participants

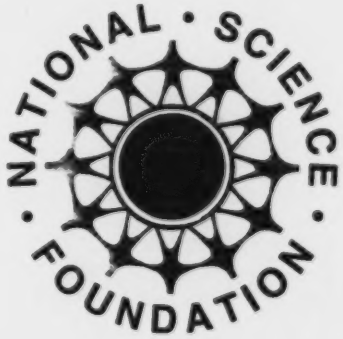
Projects may be residential or commuter camps and must be focused exclusively on students entering 7th, 8th, or 9th grades; participants in the SSC must be underrepresented students.

Participant Recruitment and Selection

Considering the young age of the target pool, and the focus on students who may have had limited exposure to mathematics and science, grades and/or test scores should not be a major selection criteria. A combination of alternative mechanisms that indicate interest and motivation should be utilized as critical indicators of student ability to profit from the camp experience. Proposers should clearly outline their strategies for selecting student participants based on these factors.

Staff

Project staff should include a variety of science and science education personnel including precollege teachers and counselors, high school science/mathematics students, undergraduate and graduate students (as tutors and counselors), and college level faculty. The participation of scientists, mathematicians, and engineers from non-academic settings, especially professionals from underrepresented groups of the population, is strongly encouraged.



AWARDS SUMMARY: GRANTS FROM THE NATIONAL SCIENCE FOUNDATION FOR SUMMER SCIENCE PROGRAMS

1992

PROPOSALS SUBMITTED: 147
ACCEPTED: 28

Percentage of NSF/SSC awarded by state
(100% = 28)

Alabama	3.6%
Alaska	3.6%
California	14.3%
Connecticut	3.6%
District of Columbia	3.6%
Georgia	3.6%
Illinois	3.6%
Indiana	3.6%
Minnesota	3.6%
Mississippi	3.6%
New Jersey	3.6%
New York	21.4%
North Carolina	3.6%
Rhode Island	3.6%
Tennessee	3.6%
Texas	3.6%
Virginia	3.6%
Washington	7.1%
Wisconsin	3.6%

1993

PROPOSALS SUBMITTED: 135
ACCEPTED: 29

Percentage of NSF/SSC awarded by state
(100% = 29)

Alaska	3.6%
California	14.3%
Florida	3.6%
Georgia	3.6%
Indiana	3.6%
Kentucky	3.6%
Maryland	3.6%
Massachusetts	3.6%
Michigan	7.1%
New Jersey	7.1%
New Mexico	3.6%
New York	10.7%
North Carolina	3.6%
Ohio	7.1%
Oklahoma	3.6%
Pennsylvania	3.6%
South Carolina	3.6%
South Dakota	3.6%
Texas	10.7%

BEST COPY AVAILABLE

NSF FUNDED SUMMER SCIENCE CAMPS IMPACT DATA (FISCAL YEARS)

	1992	1993	1994	1995	Total
SSC Proposals Submitted	147	135	148	121	551
SSC Awards Granted	28	29	30	35 (9 reawarded)	122
SSC Students Served	1742	1562	1450	1956	6710
Average SSC Project Size (Students)	61	56	60	75	63
Average SSC Award Size	$78,571	$75,000	$80,900	$79,000	$78,367
Average SSC Funding (in millions)	$2.2	$2.6	$2.1	$2.5	$2.3
Average Cost Per SSC Student					$1,250

1994

PROPOSALS SUBMITTED: 148
ACCEPTED: 30

Percentage of NSF/SSC awarded by state
(100% = 30)

Alabama	3.4%
Arkansas	3.4%
California	20.7%
Colorado	3.4%
Georgia	3.4%
Illinois	3.4%
Massachusetts	6.9%
Minnesota	3.4%
Missouri	3.4%
Nebraska	3.4%
New Jersey	3.4%
New York	13.8%
North Carolina	6.9%
Pennsylvania	3.4%
South Carolina	6.9%
Tennessee	3.4%
Texas	6.9%
Washington	3.4%

1995

PROPOSALS SUBMITTED 121
ACCEPTED: 35

Percentage of NSF/SSC awarded by state
(100% = 35)

Alabama	3.0%
Alaska	3.0%
Arkansas	3.0%
California	12.1%
Colorado	3.0%
Connecticut	3.0%
Delaware	3.0%
Florida	6.1%
Georgia	3.0%
Illinois	3.0%
Indiana	3.0%
Massachusetts	3.0%
Michigan	3.0%
Mississippi	6.1%
Missouri	3.0%
New York	12.1%
North Carolina	6.1%
Puerto Rico	3.0%
South Carolina	3.0%
Texas	3.0%
Virginia	6.1%
Wisconsin	6.1%

WHERE ARE WE? PROGRAM LOCATIONS IN THE UNITED STATES

NATIONAL SCIENCE FOUNDATION FUNDED SUMMER SCIENCE CAMPS IN 1992

Total Camps: 28 **States Involved: 19**

NATIONAL SCIENCE FOUNDATION FUNDED SUMMER SCIENCE CAMPS IN 1993

Total Camps: 29 **States Involved: 19**

Source: Jason Kim, Ph. D., 1995 Summer Science Camps - Summary of Impact Statistics Report for the National Science Foundation, Systemic Research, Inc., Dedham, MA 1995

BEST COPY AVAILABLE

NATIONAL SCIENCE FOUNDATION FUNDED SUMMER SCIENCE CAMPS IN 1994

Total Camps: 30 **States Involved: 18**

NATIONAL SCIENCE FOUNDATION FUNDED SUMMER SCIENCE CAMPS IN 1995

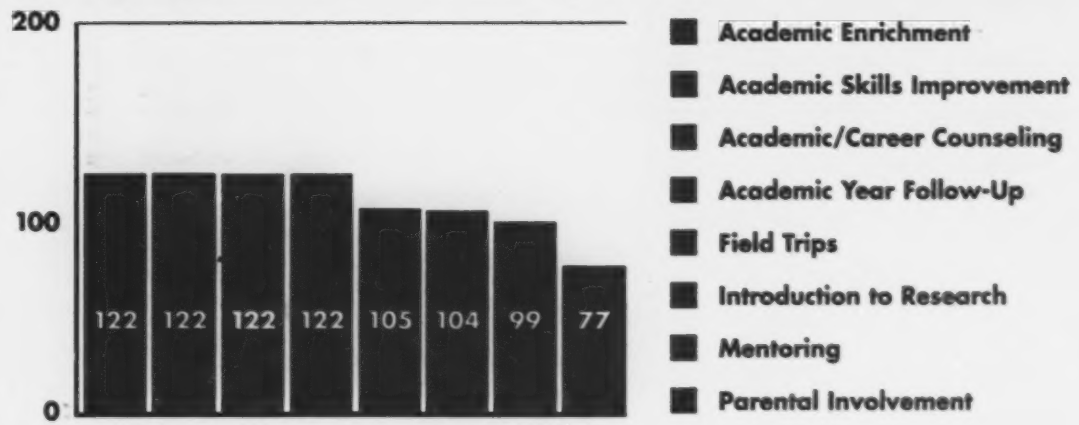
Total Camps: 35 **States Involved: 22**

Source: Jason Kim, Ph. D., 1995 Summer Science Camps – Summary of Impact Statistics Report for the National Science Foundation, Systemic Research, Inc., Dedham, MA 1995

BEST COPY AVAILABLE

WHAT ARE THE PRIMARY COMPONENTS OF THE SUMMER SCIENCE CAMP PROJECT DESIGN?

COMPONENTS OF ALL 122 NSF FUNDED SUMMER SCIENCE CAMPS FROM 1992 TO 1996



The primary components of all (100%) Summer Science Camp project designs offered to all participating students during the 1992 to 1996 NSF Summer Science Camp funding period were:

- **Academic Enrichment**
- **Academic Skills Improvement**
- **Academic Career Counseling**
- **Academic Year Follow-up.**

These components underline the strong academic focus of the Summer Science Camps, reflecting their mission and the limitations of funding by the NSF. Subjacent to this academic focus, Summer Science Camp project designs also offered **Field Trips (86.1%), Introduction to Research (85.2%), Mentoring (81.1%),** and **Parental Involvement (63.1%)** to the participants.

ACADEMIC FOCUS: 100%

100%	**Academic Enrichment Component**
100%	**Academic Skills Improvement Component**
100%	**Academic/Career Counseling Component**
100%	**Academic Year Follow-Up Component**

All 100% of the Summer Science Camps developed in their project designs an **academically centered curriculum** for the young middle school students during the 1992 to 1996 NSF funding period, in order to increase participants' knowledge in mathematics and sciences with:

- Instructional enrichment activities in college classroom settings,
- Involvement in laboratories,
- Field work integrating the study of mathematics and sciences into the natural environment,
- Counseling regarding career opportunities in mathematics and sciences,
- Instruction in verbal and written communication skills as they relate to mathematics and sciences,
- Advanced course work, participation in mathematics and science fairs, and tutorials in these subjects.

The presence of all these components in the Summer Science Camp programs maximized the participants' learning experiences in the areas of mathematics and sciences.

FIELD TRIPS: 86.1%

86.1%	**Field Trips Component**
13.9%	**No Field Trips Component**

Eighty-six percent (86.1%) of all National Science Foundation funded Summer Science Camps projects reported to offer a Field Trip component in their program activities to the participants during the 1992 to 1996 NSF funding period. A very small percentage (13.9%) reported not to include field trips in their Summer Science Camps.

Field trips were a strong motivation for the young participating students. It was the most important resource available for teachers during the Summer Science Camp to relate the mathematics and sciences content to the immediate world. The answers to students' questions were often found in museums, laboratories, businesses, health organizations, and in the communities. The use of field trips as a "classroom" went beyond the hands-on approach.

INTRODUCTION TO RESEARCH: 85.2%

85.2%	**Introduction to Research Component**
14.8%	**No Introduction to Research Component**

Eighty-five percent (85.2%) of the Summer Science Camps reported to have an Introduction to Research component for the middle school participants during their summer science programs during the 1992 to 1996 NSF funding period. A small percentage (14.8%) did not introduce Introduction to Research in their Summer Science Camp project design.

Mathematics and sciences instruction was taken out of the traditional classroom and transformed into learning activities and experiences centered around research projects which stressed scientific inquiry methodologies, command of teamwork, communication skills, and leadership in technology, sciences, and mathematics.

The Introduction to Research component led students to:

- Opportunities to assume responsibility for defining their own objectives,
- Learning conditions for extensive integration and applications of mathematics and sciences knowledge,
- Practice personal interactions, share experiences, mutual understanding, and effective communication in the research project process,
- Ponder research projects in mathematics, sciences, and technology of social concern and pertaining to human needs.

MENTORING: 81.1%

81.1% **Mentoring Component**

18.9% **No Mentoring Component**

Eighty-one percent (81.1%) of the National Science Foundation funded Summer Science Camp project designs included the Mentoring component during the 1992 to 1996 NSF funding period. A smaller percentage (18.9%) of all Summer Science Camps reported not to offer this activity to the participating students.

The Mentoring component served to organize contacts with successful professionals and their work in mathematics and sciences, resulting in:

- Sustained student interest and motivation in careers in the sciences and mathematics,
- Direct dialogue between students and professionals in mathematics and sciences acting as mentors,
- Development of partnerships between schools, colleges, community professional organizations and businesses in fields related to mathematics and sciences.

PARENTAL INVOLVEMENT: 63.1%

63.1% **Parental Involvement Component**

36.9% **No Parental Involvement Component**

Sixty-three percent (63.1%) of the Summer Science Camp project designs included a Parental Involvement component during the 1992 to 1996 NSF funding period. A lower percentage (36.9%) of Summer Science Camps did not offer this component to its participants.

Involvement of parents was an essential component for the effectiveness of the Summer Science Camps. Parents played a vital role in their children's learning experiences during the summer science programs. This was achieved by:

- Parents attendance of Summer Science Camp orientation sessions, special workshops, closing ceremonies, and field trips,
- Building rapport between parents, students and Summer Science Camp staff,
- Enlisting parents as full partners in the Summer Science Camp education of their children and beyond.

The results of the Parental Involvement component during the Summer Science Camps were:

- A rise in participants' achievement scores in mathematics and sciences,
- An improvement of participants' attendance during the Summer Science Camp,
- An improvement of participants' motivation, self-esteem, and behavior.

WHAT DESIGN TYPES DO THE SUMMER SCIENCE CAMPS FOCUS ON?

69% **Commuter**

27% **Residential**

4% **Both Combined**

The most frequently reported Summer Science Camp design was **commuter (69%)**, followed by **residential (27%)**, and a very small percentage of Summer Science Camps had both **commuter and residential (4%)** project designs. The major contributing factor for selecting the commuter design was the young age of the Summer Science Camp participants, who were mostly selected from middle school grade levels. The commuter design of the Summer Science Camp permitted the young attendants to receive six to seven hours of daily instructional services at a college campus or other instructional site, along with full days of scheduled field trips. Late afternoon student dismissal allowed the participants to share their daily Summer Science Camp experiences at home with their parents. The residential Summer Science Camp exposed the middle school students to college life on campus, college facilities, and academic enrichment activities. A small percentage of Summer Science Camps selected a combined commuter and residential design, with participants attending college campuses or other educational sites for about a week and then continuing to receive academic enrichment activities in a commuter type of Summer Science Camp.

WHAT SCIENCES DISCIPLINES DO THE SUMMER SCIENCE CAMPS FOCUS ON?

23.8%	**Physics**
21.5%	**Biology**
19.7%	**Chemistry**
17.9%	**Ecology**
9.4%	**Geology**
4.7%	**Marine Biology**
2.9%	**Health Sciences**

The most frequently reported **science** discipline selected by the project directors in their sciences curriculum was **Physics (23.8%)**, followed by **Biology (21.5 %)**, and **Chemistry (19.7%)**. However, the majority of the Summer Science Camps was characterized by an integrated science curriculum, engaging students to connect abstract scientific knowledge from several sciences with real-life applications. The teaching-learning process focused first on relevant sciences applications and then on scientific content.

WHAT MATHEMATICS-RELATED DISCIPLINES DO THE SUMMER SCIENCE CAMPS FOCUS ON?

40.2%	**Mathematics**
25%	**Computer Science**
22.3%	**Engineering**
4.7%	**Astronomy**
3.5%	**Aviation/ Aerospace**
2.3%	**Architecture**
2%	**Economics**

The predominant Mathematics-related discipline selected by the project directors in their Mathematics curriculum was **Mathematics (40.2 %)**, represented by *Algebra, Trigonometry, Geometry, Probability, and Statistics;* all strongly connected to real-life situations and enhancing the students' problem solving skills. Following Mathematics, **Computer Sciences (25 %)** and **Engineering (22.3 %)** had the highest frequency of selected content included in the Mathematics curriculum of the Summer Science Camps, increasing the participants' computational skills and career interests in Engineering fields.

WHAT OTHER DISCIPLINES DO THE SUMMER SCIENCE CAMPS FOCUS ON?

64.3%	**English**
12.5%	**Anthropology**
10.7%	**Radio &Telecommunications**
8.9%	**Art**
1.8%	**Psychology**
1.8%	**Photography**

A significant percentage of the Summer Science Camp curricula focused on **English (64.3%)** to develop participants' communication skills. The Summer Science Camp English curricula encouraged the students to write reports and give presentations about their mathematics or sciences projects. Communication and information acquisition skills, along with research activities were designed to provide the young participants with the tools and confidence needed in their future academic careers.

STEP • Knight Foundation • MESA • Boeing • YMCA • Exxon • Southwestern Museum of Sciences • Procter&Gamble • National Weather Service • Discovery Program • Alliance for Minorities in Mathematics, Sciences & Engineering • The National Aquarium in Baltimore • Liberty Partnership Programs • Bronx Botanical Garden's Institute of Ecological Studies • Engineers Foundation of Ohio • The Edwards Aquifer Research and Data Center • The American Camping Association • Department of Energy • The Hartford Foundation • The National Society of Black Engineers • The Association of American Medical Colleges • The Philadelphia School District • The Honey Hollow Environmental Education Center • Audubon Society of Pennsylvania • The Legacy Program • Southwestern Museum of Science & Technology: The Science Place • Dallas Black Churches • The Dallas Roman Catholic Diocese • Dallas Independent School District • California Museum of Science • Upward Bound Program • Private Industry Council Program • The National Science Foundation Alliance for Minority Participation • CBS • General Motors • WDIV TV Channel 4 • Howard Hughes Medical Institute • The National Institute of Health • The East Bay Consortium of Education, Inc. • The New Mexico Museum of Natural History and Sciences • The American Indian Science & Engineering Society • The U.S. Space Foundation • PBS • Wolf Watch • The New York State Power Authority • Lever Bros. Co. • Southwestern Bell Telephone • NASA-Johnson Space Center • The Cooperative Extension Service 4H • The South Carolina Peak Institute • The Houston Center for the Study of the Black Experience Affecting Higher Education • The California Marine Institute • The The Edinburg Consolidated Amelia Peabody Foundation • Foundation • The American Honda Organization for the Professional Engineers • IBM • International AETNA • The Greater Seattle Breakfast Club: African-American Washington Mutual Savings Bank The New York City Board of Office of Education • The Office Migrant Education, California • of Tlingit • Haida Indian Tribes • Chilkoot Culture Camp • Allied AMOCO • The Gary Community Northern Indiana Public Service • Sandia National Laboratories • Today's Youth/Tomorrow's World • Home, Inc. • Black MBAs • The National Society of Black Engineers • Urban Bankers' Forum • METCO • Boston Lowell Public Schools • Hewlett Packard • Mitre • Raytheon • Wheelabrator • Kiddie Kollege Program • Charlotte Mecklenburg International Baccalaureate Program • Children's Museum of Denver • Fellowship Camp at Blackhawk • Supporting Agency Volunteer Ventures for Youth • Visiting Scientist Program • Office of Employment of the City of Denver • Monterey Peninsula School District • Alpha Kappa Alpha Sorority • Bay Bank • Boston Private Industry Council • PALMS • NUCRM • Holman Cement Company • Holly Hill • Albermarle Corp. • Union Camp • Metal Leve • Orangeburg Department of Public Utilities • Black Child and Family Institute in Lansing, Michigan • Association for Leadership Development in Pontiac, Michigan • Benton Harbor Independent School System • NYNEX Foundation • IBM Brooklyn • Pratt Institute • Brooklyn Union & Gas • The Mathematical Association of America • The State of California Pipeline Project • The Corporation for National and Community Service • Alaska Department of Environmental Conservation • Alaska Space Grant Program • Seldovia Village Tribe Alaska • Science & Technology Foundation • New Brunswick Tomorrow • Johnson & Johnson • Church & Dwight Co., Inc. • The Environmentors Project of Princeton • AgBiotech • Pacific Bell • Syntex • Hewlett-Packard • Bechtel Bush Foundation • The Southern Wrigley Marine Science Center • Independent School District • The Citizens Bank • The Polaroid Foundation • The National Advancement of Black Chemists & Paper • St.Luke's Hospital • Chamber of Commerce • The Business & Professional Men • • U.S. West Communications • Education • Stanislaus County of Bilingual and the Office of Earthwatch • The Central Council The Discovery Foundation • The Signal Aerospace • Ameritech • School Corporation • The United Steel Gary Works • The The Fuller Foundation • ESRA •

NATIONAL SCIENCE FOUNDATION

Summer Science Camp Programs building partnerships with:

Success through Collaboration!

"During these times of budgetary cutbacks in the public sector, the first programs to be eliminated are those not deemed absolutely essential to meeting the mandated educational minimums. This means that programs designed to attract, motivate, and prepare children from under represented groups of society to careers in science and engineering are usually quickly eliminated. This places a funding burden on both the private sector and federal aid to education. The National Science Foundation has historically been the agency that has stepped in to meet these needs. At the City College of the City University of New York, we have had several decades of experience with programs designed to bring under represented students to careers in sciences. Our experience with the Summer Science/Math Camps has been very positive. These Summer Science/Math Camps enable students to get fully immersed in a science atmosphere where fun and learning commingle productively. Much planning, especially from a curricula standpoint, must be done in order for these programs to be truly effective."

•

Dr. Alfred S. Posamentier,
Deputy Dean,
the City College of the
City University of New York

Let me tell you who I am.

BEST COPY AVAILABLE

SUMMER SCIENCE CAMP IN BIRMINGHAM

"Watching and studying are acceptable only after the experience of doing.... The younger the student, the more crucial the contact with doing rather than lecturing."

The **Alabama School of Fine Arts (ASFA)** Mathematics and Science Program received funding from the **National Science Foundation** in 1994 to conduct the four-week commuter **"Summer Science Camp in Birmingham"** for 58 under represented students in 7th and 8th grade, recruited by advertisement in Birmingham County.

The Summer Science Camp's **objectives** are to increase enthusiasm for science and mathematics in program participants, to act as a conduit for knowledge of and access to programs in science and mathematics for older students, and to increase participants' awareness and knowledge of both the historical and current roles of under represented scientists and mathematicians.

The project design is modeled after the innovative hands-on **curriculum** of the host institution, the Alabama School of Fine Arts' Math and Science Program. The curriculum content is divided into week-long modules, which emphasizes the approach that math and sciences are subjects to be experienced and done. *Dr. Michael J. Froning, Program Director of the "Summer Science Camp in Birmingham"*, states: **"...watching and studying are acceptable only after the experience of doing.... The younger the student, the more crucial the contact with doing rather than lecturing."**

It is worth to mention that most of the participants have no prior laboratory experience, hence the science module focuses on introducing the students to basic lab techniques to enable them to carry out discovery-based science projects. The math module centers on statistics and data analysis. Each student carries out a science project with an emphasis on using self-gathered data for the project, rather than data gathered by others. Teaching strategies involve integrating research methodologies into the regular classroom.

The Summer Science Camp **staff** consists of African-American college faculty, local school teachers, college student assistants, and high school students serving as mentors for the participants.

One parent states: **"...For my daughter, who attends a predominantly**

White middle school, the opportunity to be mentored by Black faculty and collaborate with talented Black youth has been a boon."

The program schedule starts off with weekly **field trips** on Mondays, which are utilized to provide data and material for the week's activities in science and for some of the mathematics activities. For example, soil and water samples are taken from ponds and forests. During the rest of that particular week students use the samples in their science classes, in chemical analysis activities. They then process the results of these experiments in math class by creating spreadsheets, graphs, and charts. Field trips during the 1995 summer program included a visit to the Alabama Power Headquarter, to Lake Purdy, a local environmental outdoor facility, and to the Fern Bank Museum.

The "Student Scientific Conference" activity allows participants to develop one of their interest areas into a science project to be presented at the "Science Fair Closing Ceremony" of the Summer Science Camp.

The **academic year follow-up program** is comprised of eight sessions, designed to increase the transfer of learning from the Summer Science Camp to the regular classroom. The Alabama School of Fine Arts assists the participants' regular school year teachers with outreach activities to enhance students' transfer of learning.

Parent quotations attest to the program's success. Some *parents* indicated that the Summer Science Camp **"should be a six or eight week program,"** that their sons and daughters **"developed logical thinking"**, and **"the high involvement of the students created the much needed science awareness."** •

The Summer Science Camp's objectives are to increase enthusiasm for science and mathematics...and to increase participants' awareness and knowledge of both the historical and current roles of under-represented scientists and mathematicians.

A young Science Camp participant performs one of many interesting chemical analysis experiments.

SUMMER SCIENCE CAMP AT ALABAMA'S A&M UNIVERSITY

The sciences curriculum follows the "Lawrence Livermore Study of Science in Nature" (LESSON), which is geared toward middle school students.

Funded by the **National Science Foundation** from 1992 to 1995, the commuter **Summer Science Camp at Alabama's A&M University** has provided 54 under represented students entering 7th through 9th grade each year with a curriculum designed to improve their science and mathematics skills, to motivate them to consider careers in sciences, and to better their self-esteem.

An array of educational enrichment activities has been the hallmark of the curriculum for each of the Summer Science Camps at Alabama A&M University over the past three years. The activities in the **curriculum** for the Summer Science Camp students are focused in the areas of mathematics, science, communication skills, science ethics, problem solving in science and mathematics, library/study skills, research projects, motivation, field trips, and career exploration. All of these activities are designed to provide challenges and plenty of opportunities for the participants to enhance their knowledge and training for the next academic year. The activities are lead by University faculty, graduate and undergraduate students.

The themes of the science activities in the Summer Science camp program are from the LESSON (Lawrence Livermore Study of Science in Nature) materials developed by the Lawrence Livermore National Laboratory. These science materials, including laboratory experiments, are geared toward the middle school student. A total of 43 outstanding science activities are used in the areas of physics, electricity and magnetism, chemistry, and biology. In addition to LESSON, the students are given lectures and demonstrations concerning lasers and crystal growth at Alabama's A&M University. Procedures and methodology of science or mathematics projects are discussed and demonstrated in the research methods and library skills segments of the Summer Science Camp. Based on these experiences, participants are required to present a science or mathematics project for competition near the end of the program. Three prizes are awarded for mathematics and sciences respectively.

The mathematics training provided to the Summer Science Camp participants is set at a higher level than classes during the regular academic year. Algebra, geometry, elementary probability, elementary statistics, trigonometry,

scientific and graphing calculators are taught in the mathematics module.

The communications skills segment of the Summer Science Camp curriculum is intended to help students improve their oral and writing skills.

al National Science Foundation funded "Alliance for Minority Participation" (AMP) program.

"...One final note is that we believe that all of these activities contribute to the success of our Summer Science

Our follow-up information has shown that about 85% of our students going on to high school take biology or physical science, while 80% take algebra I or geometry.

Students are taught appropriate speaking and writing procedures, as well as given the opportunity to give short speeches and write papers on current events.

Motivation and career exploration components of the Summer Science Camp are considered as important as any of the other components. Science, mathematics, engineering and technology career speakers are selected and coordinated by the local chapter of the National Society of Black Engineers.

The Summer Science Camp at Alabama's A&M University also sponsors **academic year follow-up enrichment activities** for the summer participants once a month from October to April. A few examples of the kind of enrichment activities are: demonstrations of electronic algebra, chemical principles, recreational mathematics, and information sessions about college conducted by scholars from the region-

Camp students," says *Program Director Dr. Jerry Shipman.*

"...Overall, our follow-up information has shown that about 85% of our students going on to high school take biology or physical science, while 80% take algebra I or geometry."

Parents attest to the Summer Science Camp's success and positive impact on their children: **"...I found the itinerary to be very educational and interesting. My daughter thoroughly enjoyed the program. I believe that she will be a giant step ahead when she goes back to school this fall. The program was just great."**

The mother of participant Brian Baldwin agrees: **"...My husband and I appreciate the work of the program. Without it I am sure that our son Brian would not be doing as well in mathematics and science. He has shown more interest and dedication in studying science and mathematics as a result of participating in the program."** •

SUMMER SCIENCE CAMP AT TALLADEGA COLLEGE IN ALABAMA

Dr. Arthur L. Bacon, Program Director for **Talladega College's** 1996 **National Science Foundation** funded Summer Science Camp writes: **"...We at Talladega College are very pleased to conduct a National Science Foundation funded Summer Science Camp during the summer of 1996. This will mark the first time that the college has had such an effort. Since we have consistently conducted high school and undergraduate science enrichment programs over the years, the Summer Science Camp constitutes a significant extension of the science, engineering, and mathematics pipeline into that pool of young students who are our best hope in increasing the numbers of scientists. This is consistent with a National Science Foundation study which says ...the earlier we start the more successful we will be."**

With its Summer Science Camp, Talladega College provides an opportunity for under represented middle school students to improve their math and sciences school performance in order to be prepared for high school, college, and ultimately professional careers in these fields.

Participants are involved in hands-on science experimentation in a **curriculum** focusing on biology, chemistry, mathematics, computer science, and physics.

Professional scientists, mathematicians, and engineers are invited to the Summer Science Camp program as guest speakers to provide **career information** and serve as role models at the same time.

Field trips to various sites of scientific interest complement and enhance the other program activities.

Academic year follow-up activities are scheduled to provide further academic and career counseling, to involve parents in their children's education, and to develop the participants individual science research projects.

> The need for a Summer Science Camp is extremely acute in this region... Talladega College is located in an area which does not provide its youth with many learning and enriching activities during the summer. The Summer Science Camp will do much to remedy this situation.

The President of Talladega College, Joseph P. Johnson, cheers the National Science Foundation newly funded Summer Science Camp: **"...Talladega College is pleased to have a new Summer Science Camp program funded by the National Science Foundation. This is our first summer program designed for middle school students."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Alabama School of Fine Arts, Birmingham, Alabama	58	4 weeks	6, 7, 8	1, 2, 3, 6, 7, 8, 9
Alabama A&M University, Normal, Alabama	54	6 weeks	7, 8, 9	1, 2, 3, 4, 6, 7, 8, 9, 10
Talladega College, Talladega, Alabama	50	6 weeks	6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

ELLAMEK ELICARAQ: SUMMER SCIENCE CAMP

ANCHORAGE SCHOOL DISTRICT IN ALASKA

Program Director Edna Lamebull says "...'Ellamek Elicaraq' was selected as the name of the camp, because it represents a blending of the traditional Yupik culture with the western society the students live in today. Translated, 'Ellamek Elicaraq' means 'Learning About Our World', which is what we want our students to do during their participation in the program."

Taking advantage of the midnight sun, each year 40 Alaska Native and Native American students in 8th and 9th grade selected from the **Anchorage School District**, and 10 students from outside Anchorage, participated from 1994 to 1996 in the **National Science Foundation** funded six-week commuter **"Ellamek Elicaraq" Summer Science Camp.** A large number of agencies, Native Corporations, and professionals help to successfully develop this Summer Science Camp. The "Ellamek Elicaraq" Summer Science Camp **curriculum** is designed to provide exciting, career-oriented, and culturally relevant science and math experiences, grounded in real-world, hands-on exploration, for the participants.

The **program's purpose** is to provide the participants with the basic tools to choose science and math courses in high school, to stay, excel, and graduate from high school, to encourage them to select sciences, math, or technology majors at the college level, and ultimately careers in these fields.

The "Ellamek Elicaraq" Summer Science Camp curriculum's science disciplines are integrated with applied math concepts and activities requiring writing, speaking, reading, and computer skills. Explorations of science, engineering and careers in petroleum-based industries have been components of all three summer programs from 1994 to 1996. Major areas of study were biology in 1994, including marine biology, microbiology, botany, forestry, animal studies, and ornithology; physics and technology in 1995, focusing on forces, weather, and aerospace; and geology and minerals extraction in 1996, centering on geology, geophysics, and chemistry.

Cultural heritage has played a major role in building self-esteem and linking tradition with the science, engineering, and math careers of tomorrow.

Instructional methods applied in the Summer Science Camp activities are contextual, i.e., they are practiced and

Anchorage School District

Students and teachers of the "Ellamek Elicaraq" Summer Science Camp explore the Alaskan environment on a field trip to examine glacial ponds.

applied in the field, lab, and workplaces most central to the future of the participants. As students see, construct, and understand the connections between their own lives and careers in science, they begin to believe that such careers are within their reach. They are beginning to set up the goals and plans to achieve such careers.

Students are encouraged to interact closely with the environment. A variety of motivational activities such as participants drawing and painting wildlife, camping out on Kenai Peninsula, learning about edible plants, talking to Tribal Council elders, and experiencing integrations of science and art with the help of nature artists, complement the rich learning experiences in the summer program.

Although the exploration of the Anchorage area is the core site of the program, out of town **field trip** work has taken participants to other major investigation locations of marine activity, forestry, fisheries, oil refining, rocketry, and mining over the three-year period.

The "Ellamek Elicaraq" Summer Science Camp curriculum is designed to provide exciting, career-oriented, and culturally relevant science and math experiences, grounded in real-world, hands-on exploration, for the participants.

Native Alaskan and American culture elements, provided by elders and investigations in the area, have been a strong emphasis of the Summer Science Camp curriculum from the start. **"...Cultural heritage has played a major role in building self-esteem and linking tradition with the science, engineering, and math careers of tomorrow,"** explains *Program Director Edna Lamebull.*

Professional **staff** scientists and engineers, University research scientists, college students, high school students, previous Summer Science Camp participants, and tribal tradition bearers all serve as role models, mentors, co-learners, and instructors for the Summer Science Camp participants.

Parents participate in the culminating activity of the program, an event for sharing the results of the students' research projects with a wider audience, and an opportunity for students to be recognized for their achievements during the Summer Science Camp. •

BEST COPY AVAILABLE

WESTERN ALASKA'S NATURAL SCIENCES SUMMER CAMP

Flying into the 'Yukon Delta Environmental Education Camp' funded by the National Science Foundation is the only way to get 30 Native Alaskans 6th, 7th and 8th grade students to the remote Summer Science Camp site," says *Program Director Dr. Polechla.*

The **University of Alaska at Fairbanks** conducted this residential 10-day Summer Science Camp from 1993 to 1995. The Summer Science Camp is held near Bethel, Alaska, in the heart of the **Yukon Delta National Wildlife Refuge**, about 400 miles away from the nearest connecting road, attracting young participants who have never been away from their villages.

The Yukon Delta Region is in need of collection of basic biological data. The students are immersed in this task, and thus become familiarized with a variety of different methods of scientific research and problem solving skills. The program **curriculum** integrates bear ecology, geology, beaver pond community ecology, ethnobotany, ethnozoology, natural resource management, ornithology, stream ecology, mammalian ecology, habitats, geology, paleontology of the Kilbuck Mountains and Kukoskwim River, applied microbiology, and herpetology into its field projects. The activities are conducted in a culturally appropriate and relevant way. The understanding of the natural history of Western Alaska is emphasized by Native Alaskan people. A strong emphasis is on increasing participants' basic knowledge of environmental sciences by instructing them in scientific methodology. The **staff** consists of qualified Native and non-Native people.

Dr. Polechla states that: **"...The Yukon Delta Environmental Summer Science Camp staff comes from a variety of ethnic and professional backgrounds: Local Native American Elders, who come in order to share their traditional knowledge of fishing and hunting with the participants; Scientists from the Alaska Department of Fish and Game; Representatives of the Calista Native Corporation, which owns the land where the Summer Science Camp program takes place; the National Audubon Society, which published an article in its magazine "Audubon" on the success of the Summer Science Camp**

"...Many of the students begin to seriously think about making a career in the natural sciences and strive for leadership in these fields...The camp is a positive investment in the future, and it works!"

NATURAL SCIENCES SUMMER CAMP

"...The camp environment was a valuable tool in providing an immersion experience in natural sciences... Experiential science activities at camp produced an active exploratory style of learning..."

program and its participants..." All of them provide information on their respective work along with career exploration opportunities. College students participate in the Summer Science Camp as role models and mentors, coaching the participants in the field of scientific methodology.

One of the *teaching assistants* says about the participants: "...They first come with a sense that they can't learn anything worthwhile that can help them improve their personal lives and the problems in their villages. A lot of those children leave however, not only with new-found skills, but also with an increased confidence that they CAN make a difference with a little work and education. I also notice that many of the students begin to seriously think about making a career in the natural sciences and strive for leadership in these fields...The camp is a positive investment in the future, and it works!"

In the spring a follow-up science program called "Wild Week" is implemented at one of the six participating local schools.

Program Director Dr. Polechla summarizes the Summer Science Camp's success as follows: "...The camp environment was a valuable tool in providing an immersion experience in natural sciences...Experiential science activities at camp produced an active exploratory style of learning... The camp allowed students to develop relationships with adults who offer exposure to and information about science-related careers and practices." •

Culturally appropriate, enjoyable natural science activities are part of the Summer Science Camp.

BEST COPY AVAILABLE

"CAMP WATER" SUMMER SCIENCE CAMP IN ALASKA

The Juneau School District is grateful that it received funding for its 1996 Summer Science Camp called "CAMP WATER" from the National Science Foundation. *Program Director Annie Calkins says:* **"...Until we received funding from the National Science Foundation, we were unable to develop an enriching summer experience for the targeted female Alaska Native middle school students that would be academically challenging, supportive and fun."**

"CAMP WATER" integrates the thematic components of "The Natural World of Southeast Alaska" and "The Traditional World of Tlingit Indian Culture" into its curriculum by providing its participants with unique learning experiences in a combined residential and commuter Summer Science Camp.

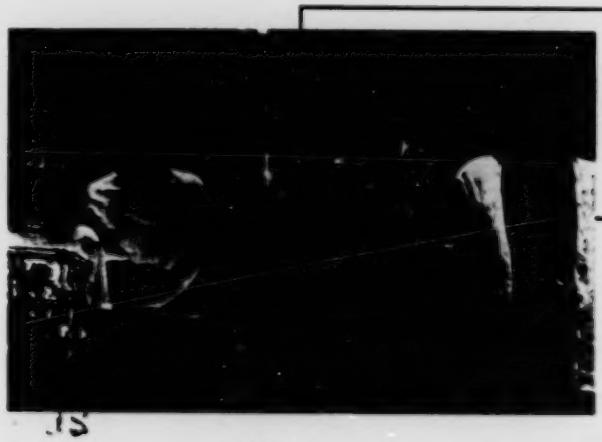
> "Until we received funding from the National Science Foundation, we were unable to develop an enriching summer experience for the targeted female Alaska Native middle school students that would be academically challenging, supportive and fun."

The main **goal** of "CAMP WATER" is for students to learn mathematics and sciences primarily through data collection and analysis, in both the natural and traditional worlds; it also encourages students to consider a variety of careers in resource management.

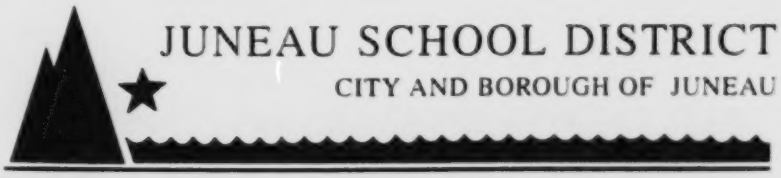
There are seven central strands within the **curriculum** design: stream studies, oceanography, Tlingit culture and traditions, mathematics problem solving and reasoning, outdoor skills, technology, self-esteem/trust building, and career exploration. Indigenous ways of knowing are integrated throughout the curriculum, and "real life connections" and applications supplement the concepts developed during "CAMP WATER".

Experiences with the Summer Science Camp's new mathematics curriculum are incorporated in the regular school curriculum of the Juneau and other School Districts.

Students have the opportunity to explore remote Admiralty Island on a camping and canoeing **field trip**, accompanied by wilderness guides, natural history experts, and teachers.



Staff members of the "Camp Water" Summer Science Camp in Juneau, Alaska.



JUNEAU SCHOOL DISTRICT

CITY AND BOROUGH OF JUNEAU

Classroom instruction prior to the trip provides students with the necessary knowledge and skills in the fields of physical science, engineering, life science, earth science, and mathematics. This allows the participants to collect data, graph, measure, summarize, and analyze it in a professional, scientific manner to prepare their final projects. The work on these projects is facilitated by local scientists and mathematicians, who also give insight into math and science related careers.

Project Director Annie Calkins says: **"... 'CAMP WATER', a stellar example of collaboration, creative thinking and serious problem solving goes right to the heart of environmental and natural resource issues facing the citizens of Southeast Alaska. We truly appreciate the support of the National Science Foundation in launching this outstanding summer opportunity."**

Juneau District School Board President Phil Smith values "CAMP WATER" in this following statement: **"... Nurturing scientifically literate students and citizens is a goal of the Juneau School District. Their careful stewardship of our lands and waters in the future will be the real legacy and testimony of their education. Experiences like 'CAMP WATER' contribute greatly to their abilities to be thoughtful and responsible stewards."**

Five days of the program are spent at the **Tlingit Culture Camp**, located forty miles from Juneau and only accessible by ferry. Native Alaskan elders and recognized community leaders immerse students in the traditions and values of the Tlingit culture.

During the **academic year, follow-up activities** focus on further developing the participants' research projects.

"CAMP WATER" has been able to secure additional support from "Earthwatch", a non-profit organization that supports the efforts of more than 120 scientists working in a wide range of disciplines to search for solutions to global environmental problems. *Earthwatch Director of Education, Tally S. Forbes*, pledges: **"... 'Earthwatch' would be delighted to collaborate with the Summer Science Camp project in Juneau. We have the technology and resources in place to support you in some very exciting ways, like providing Internet access for the participants."**

The Central Council of Tlingit and Haida Indian Tribes of Alaska, the University of Alaska Southeast, the Discovery Foundation, and the Chilkoot Culture Camp all collaborate to set up this National Science Foundation Summer Science Camp. •

Summer Science Camp:	Number of Participants	Program Length	Grade Levels	Activities
Anchorage School District, Anchorage, Alaska	30/40/50	6 weeks	7, 8	1, 2, 3, 5, 7, 9, 10
University of Alaska at Fairbanks, Bethel, Alaska	40	10 days	6, 7, 8	1, 2, 3, 4, 6, 7, 8, 9, 10
Juneau School District, Juneau, Alaska	40	4 weeks	7, 8	1, 2, 3, 4, 6, 7, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

MEADOWCREEK SCIENCE INSTITUTE SUMMER SCIENCE CAMP

The **Meadowcreek Science Institute** had designed a unique and exciting four-week residential Math and Science Summer Science Camp enrichment program for 50 under represented students in 7th, 8th, or 9th grade in schools in the entire state of Arkansas to take place in 1996. The program's **goal** is to encourage these students to pursue secondary and university level studies and subsequent careers in science, engineering and mathematics.

Participants in this summer science program experience the excitement of scientific discovery as they study biology by the side of a stream or sample insects in a mathematics activity. The program is designed to make sciences relevant, while developing students' communication skills and ability to utilize cooperative approaches to problem solving. This Summer Science Camp promotes hands-on, interactive science activities while participants are in residence at Meadowcreek Institute's 1500 acre outdoor classroom, which includes an 18, 000 square foot solar powered education center. The attendants are able to explore the disciplines of physics, mathematics, chemistry, geology, hydrology, biology, ecology, and horticulture through active participation in a diverse natural setting.

The Meadowcreek Science Institute inspires students to reach beyond self-imposed limitations through interactions with teaching assistants, mentors, and other role models. **Field trips** are scheduled for the participants to experience science in action and to expose them to professionals from a variety of scientific fields. **Academic year follow-up activities** for the attendants seek to carefully track them, and the mentors maintain contact with the students throughout the year.

Ironically, although the "Meadowcreek Science Institute Summer Science Camp" project was able to secure funding from the National Science Foundation, it lost the support of other necessary funds, partly due to the reduction from a three year grant period to a one year period.

Program Director Luke Elliott writes: **"...The Meadowcreek Science Institute Summer Science Camp would have reached ...students in a part of the country sorely in need of science enhancement. It is with much regret and sadness for the students and the loss of this opportunity that I write this letter...This program and other Summer Science Camps are crucial and the effects of their loss will be felt throughout the country..."** •

Summer Science Camps are crucial and the effects of their loss will be felt throughout the country. Rural and economically disadvantaged areas are particularly susceptible to apathy in science and mathematics education...It is absolutely critical that the programs be reinstated...

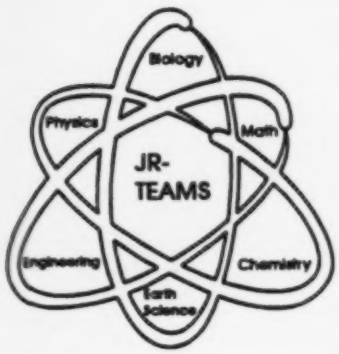
MEADOWCREEK

JOINT RECRUITING AND TEACHING FOR EFFECTING ASPIRING MINORITIES IN SCIENCE (JR-TEAMS) SUMMER SCIENCE CAMP

Faculty, staff and home school teachers are teamed together to guide participants in their science research projects.

With funding from the **National Science Foundation** in 1994, the **University of Arkansas at Little Rock**'s College of Science and Engineering Technology sponsors a four-week, commuter Summer Science Camp for 40 under represented junior high school students with an interest in and aptitude for science, engineering and mathematics. The program is called **"Joint Recruiting and Teaching for Effecting Aspiring Minorities in Science" (JR-TEAMS).**

The program's **goal** is to increase the number of under represented students from central Arkansas who will eventually pursue university degrees and careers in the sciences, engineering, or mathematics.



The science and mathematics **curricula** are part of the National Science Foundation supported Arkansas Statewide Systemic Initiative Math and Science Crusades.

The program integrates the disciplines of math, engineering, earth science, biology, computer science, physics and chemistry. The participants split up into eight teams, each mentored by a graduate or undergraduate student. The teams closely interact with one another during the hands-on laboratory and classroom activities, which included unique experiments like measuring heat energy locked inside a cashew , the physics of bottle rockets, and dissecting skeletons from owl pellets. Students name their respective teams using sciences or math concepts - for example "Krazy Chemist Kids" or "Solar Energizers" - and even invent their own team-chants, fostering further a sense of belonging and self-esteem.

The JR-TEAMS students are guided through hands-on sciences and mathematics activities by University of Arkansas at Little Rock science **staff** who are teamed with public school teachers. Each day at lunch, representatives of scientific industries, businesses and educational organizations

BEST COPY AVAILABLE

Participants of the "JR-Teams" Summer Science Camp in Arkansas visit Little Rock Air Force Base on a field trip.

provide participants with **career information** and successful role model examples in the fields of mathematics, sciences, and technology.

During the celebration at the end of the "JR - TEAMS" Summer Science Camp program, students present their respective science projects to family and friends; they then receive awards and stipends from the "JR-TEAMS" staff.

After completion of the program, participants' scholastic performances are closely monitored. **Academic year follow-up activities** on campus include academic competitions.

In order to continue the successful work of "JR-TEAMS", the same 40 students return to the program the following year. •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Meadowcreek, Inc., Arkansas Fox, Arkansas	50	4 weeks	7, 8, 9	1, 2, 3, 4, 5, 8, 9
University of Arkansas at Little Rock, Arkansas	40	4 weeks	8	1, 2, 3, 4, 5, 6, 8, 9

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SUMMER SCIENCE CAMP AT THE UNIVERSITY OF CALIFORNIA AT BERKELEY

The Summer Science Camp's primary objectives: "...to introduce students to engineering and science concepts, and demonstrate how academic course work relates to their future, how science and engineering relate to the world around them, and how the practice of science is accomplished."

The **National Science Foundation** funded the **Summer Science Camp at the University of California at Berkeley**, which is closely linked to the **Mathematics, Engineering, Science Achievement (MESA)** program on the Berkeley campus. The Summer Science Camp program provides instructional support and academic enrichment for 60 Bay Area under represented 7th, 8th, and 9th grade students during a six-week commuter summer program from 1994 to 1996.

Program Director Blas Guerrero describes the Summer Science Camp's primary objectives: **"...to introduce students to engineering and science concepts, and demonstrate how academic course work relates to their future, how science and engineering relate to the world around them, and how the practice of science is accomplished."**

The program's academic **curriculum** component consists of morning mathematics and communication skills courses, complemented by seminars on culture and ethics in science. During the afternoon, students participate in hands-on learning and science laboratory classes that teach engineering concepts. Summer Science Camp participants are engaged in science and engineering research projects, embark on **field trips**, and receive mentoring support from university faculty and professional scientists and engineers.

MESA

The **academic year follow-up program** schedules Saturday Academy sessions, after-school math and science workshops, and evening meetings that provide parents and students with information on college entrance requirements, financial aid, the transition to high school, and career options in sciences and engineering. •

Summer Science Director Blas Guerrero, far right, with, from left, Summer Science Camp Coordinator, Thomas Tramble, and student award winners Maria Herrera, Leticia Murillo, Poonam Khatri and Victor Lopez.

SUMMER SCIENCE CAMP AT CALIFORNIA STATE UNIVERSITY AT CHICO

California State University at Chico won funding from the **National Science Foundation** in 1995 for a four-week residential Summer Science Camp on its campus to serve 50 under represented students entering 7th, 8th, and 9th grade, selected by the Butte County Four Winds of Indian Education program and the Butte County Office of Education from the Chico and Oroville school districts.

California State University at Chico serves a rural and sparsely populated area with comparatively few scientific, educational, and cultural resources... students have not been exposed to the rich scientific resources available in other areas of California... The Summer Science Camp attempts to fill this gap.

California State University at Chico serves a rural and sparsely populated area with comparatively few scientific, educational, and cultural resources. Due to this geographical isolation, many under represented students have not been exposed to the rich scientific resources available in other areas of California. The Summer Science Camp curriculum attempts to fill this gap by illustrating, with hands-on emphasis, what scientists, mathematicians, and engineers do in their careers.

The Summer Science Camp **curriculum** has an interdisciplinary focus on natural sciences, mathematics, and engineering. During the first week, participants are introduced to a variety of science themes: nutrition with an emphasis on diet data collection and analysis; crystal growth experiments; use of telescopes; and bicycle design. The bicycle design becomes a development project to be carried out throughout the four program weeks. A **field trip** to Mt. Goat allows participants to apply and test their studies in bicycle design in an outdoor cycling environment. During the second program week, participants are introduced to the study of earth sciences; activities such as the finding of certain stars in a planetarium; eclipses and phases of the moon; how to utilize stars in navigation; how to create a topographical map; and the use of a map and a compass comprise the instructional activities. A **field trip** to Bidwell Park provides opportunity to apply the curricular content of the second week to the real world. The third and fourth week of the Summer Science Camp center around these four key questions: What does a computer engineer do? What does a civil engineer do? What does a mechanical engineer do? And what does an electrical engineer do?

In order to be introduced to these areas of engineering, participants receive instruction in computer graphics, computer generated animation and music, virtual reality graphics, software demonstrations, the internal parts of a computer, design criteria and properties of a dam, building a concrete canoe, and designing a bicycle using desktop publishing software. A **field trip** to Oroville Dam connects the classroom instruction with the actual field work.

At the end of the fourth week participants conclude the design process and analysis of bicycle components with the intent of being able to build a basic bicycle. They utilize their knowledge in physics, for example: "Why does a bicycle stay upright?"; chemistry, for example different materials like rubber, metal, petroleum products and their sources; and biology, for example measurement of human physiological functions, energy needed to move a bicycle, in this project. Throughout the discussions and activities pertaining to the bicycle, the roles of scientists, mathematician, and engineer are also pointed out to the participants by the staff.

The program's **staff** of University faculty and public school teachers is assisted by high school and college students. These older students not only mentor academic performance and research projects, they also provide excellent role models for the younger participants.

Parents are encouraged to participate in workshops and sessions regarding their children's further academic and professional careers.

Academic year follow-up activities are designed to focus on participants' scholastic success; specifically the students' enrollment in advanced math and science courses is monitored. Twice during the academic year a "Career Day" is scheduled to meet professionals in a seminar setting, who provide information about their careers and work experiences in mathematics, sciences, and technology. Summer Science Camp participants are encouraged to join the California State at Chico "Minorities Engineering Program" and the "Society of Women Engineers" when they become eligible seniors in high school.

This Summer Science program at California State University at Chico is the only one of its kind in the Western Region focusing entirely on Native American Youth! •

BEST COPY AVAILABLE

HARVEY MUDD COLLEGE SUMMER SCIENCE CAMP
AT CLAREMONT IN CALIFORNIA

In 1994 and 1995 **Harvey Mudd College** at Claremont in California held a **National Science Foundation** funded Summer Science Camp. The five-week commuter program served 60 under represented 7th and 8th grade students from the surrounding local schools, with the goal of motivating these students to take an interest in the study of science and math in high school, and to ultimately pursue a college education and careers in these fields to increase the number of under represented students in math and sciences.

"Harvey Mudd College Summer Science Camp" science teacher Patricia Eschbach and a young student

The **curriculum** focuses primarily on pre-engineering and is built around five modules: 1) model rockets and aerodynamic principles, 2) robotics, 3) environmental engineering, 4) chemistry, 5) architecture, engineering and building of solar cars. These modules are taught with three different instructional approaches: A) Teachers give lectures on the theory behind the experiments; B) students construct models; and C) students compare their results with the original theory.

In accordance with the "Harvey Mudd College Summer Science Camp's" **goal** to raise students' educational expectations, a series of guest speakers is invited to the program to lay out career opportunities in the scientific and technical fields, and to encourage participants to see these as viable options in their lives.

The Summer Science Camp **staff** includes outstanding professionals from the fields of engineering and science, school teachers, and college students.

MESA and **Upward Bound programs** have linked themselves with the Summer Science Camp to assist in the program activities and services, thus providing experienced staff , student tutors, and the opportunity to later enroll the Summer Science Camp graduates in these other educational enrichment programs.

Academic year follow-up activities take students on trips to four main field sites: the California Museum of Science and Industry, the Lockheed Aircraft Service Company, Rockwell International, and Education Day at Pomona Raceway.

A good retention rate (87%) and the tracked increase in interest in

"We were able to learn how to work with other people, who have different ideas and different backgrounds, which is essential to be able to work in tomorrow's world."

Students and teachers actively engaged in an engineering experiment.

"Harvey Mudd College Summer Science Camp" participants at work on their science project.

science and math, along with an improvement of academic performance prove the program's success.

Engineering professor Dr. B. Samuel Tannenbaum sums up his 30 year involvement with science and math enrichment programs for youth, and especially with the Summer Science Camp program: **"...These programs give an exciting introduction to the career possibilities in engineering and science to these young students, and make certain that they are prepared to take the courses they will need for this track when they enter high school.... I know that the National Science Foundation is truly interested in trying to increase the numbers of traditionally under represented students who major in science and engineering, and I believe that Summer Science Camps are the most cost-effective program for accomplishing this goal in the long term."**

Parent Sandra S. Biehl expresses her gratitude and appreciation in a letter: **"...We are very grateful for the Harvey Mudd program, and the opportunities our children have been given due to the existence of such programs.... The Summer Science Camp Program provided a very effective and rewarding way of teaching math and science concepts to our son, a refreshing change that will surely shape his future."**

Science middle school teacher Patricia Eschbach also underlines the positive outcome of the program: **"...Participants have a much stronger science background in the areas that were covered during the program. They are also much more sophisticated in how they handle their science course work.... The support given by the NSF towards projects of this type is invaluable to students, their parents and other family members, their teachers, and their community members."**

Summer Science Camp participant Paul Biehl testifies: **"...Last summer, the summer of 1995, I attended a Summer Science Camp at Harvey Mudd College.... We were able to program a computer, to carry out a function, ...and most important, following directions and double checking our work.... We were able to learn how to work with other people, who have different ideas and different backgrounds, which is essential to be able to work in tomorrow's world. Today most children spend their time watching television, not envisioning or even thinking as they sit and do nothing but breathe. Children of today must learn hands-on skills and be able to use those skills to make tomorrow a better place to live for everyone. We are tomorrow's leaders, and if we are ill prepared, then the world may fall apart at our finger tips."** •

BEST COPY AVAILABLE

SCIENCE TECHNOLOGY ENRICHMENT PROGRAM (STEP) SUMMER SCIENCE CAMP

In 1992 the **National Science Foundation** joined the ten-year-old successful **"Science Technology Enrichment Program" (STEP)** at the **California State University at Dominguez Hills** in funding the three-week **"STEP Summer Science Camp"** for 80 under represented 6th, 7th, and 8th grade students.

Additional funding provided by the Knight Foundation of Miami Florida and the Summer Science Camp's close collaboration with the "State Systemic Initiative in Mathematics" (Math Renaissance) account for the STEP program's growth from 106 participants in the summer of 1993 to 430 participants during the 1995 summer program! These numbers clearly speak for success and the growing interest in science and math.

At the California State University at Dominguez Hills in California

The University supports the work STEP is doing in every way possible. However, without funding from agencies such as the National Science Foundation, STEP will not be able to continue.... Our economic and technological future rests on our ability to keep that pipeline flowing.

The "STEP Summer Science Camp's" **goals** are to improve participants' science, math and problem solving skills, to increase their interest in and enjoyment of the above fields, and to encourage them to pursue a career in the fields of technology and engineering.

The "Science Technology Enrichment Program" (STEP) emphasizes a hands-on, investigative approach in a **curriculum** focusing on math, biology, chemistry, and physics, and allows the participants to work in groups during the scheduled classes. In the mathematics module students learn about the structure of the numerous system, probability and statistics, geometry, area, and value. This module focuses on units developed and recommended by the California Office of Education, allowing for excellent academic preparation of the STEP participants. In the sciences module, the participants study snails, fish, surface tension, and cell structure, to name just a few of the topics.

Summer Science Camp participants are divided into homogeneous groups according to their grade levels. The 6th grade participants receive intensive math and sciences instruction in the morning. The 7th and 8th grade participants continue to attend the "STEP Summer Science Camp" during the afternoon for classes and hands-on activities in rocketry, problem solving skills, and calculator use.

Participant Tommy Leung describes his positive experiences in one of the program's units: **"...Beside the surprising amount of mathematics involved in**

BEST COPY AVAILABLE

this unit, 'Fantasy Baseball' is also a rewarding unit ...Whereas most of the math learned in school is through textbooks, this is a hands-on experience ...Averages, fractions, decimals and degrees are all combined with America's favorite pastime into one learning experience ..."

The **staff** consists of highly trained and recognized high school teachers, which also explains the overall positive outcome of STEP. Students from a science magnet high school located on campus serve as mentors and role models for the young Summer Science Camp participants.

During the **academic year** participants meet monthly on campus for hands-on sciences classes in marine biology, earthquakes, electricity and chemistry conducted by the "Science Technology Enrichment Program" teachers. The academic year program culminates in students' participation in the "Math Mania Science Fair" in May.

Summer Science Camp Program Director Dr. Haldon L. Anderson describes the successful "Science Technology Enrichment Program" at the California State University at Dominguez Hills (CSUDH):

"...STEP ...has built a reputation for being a quality program which students enjoy and to which they like to return. Many students have started STEP only because their parents have wanted them to, and ended up begging their parents to bring them back next year. The CSUDH Center for Math and Science Education begins getting calls in December each year from parents and students alike asking for applications for the next summer. The biggest problem faced by the STEP program at this point is how to limit the number of participating students."

Dr. Robert Detweiler, President of California State University at Dominguez Hills, indicates: **"...The University supports the work STEP is doing in every way possible. However, without funding from agencies such as the National Science Foundation, STEP will not be able to continue.... Our economic and technological future rests on our ability to keep that pipeline flowing."** •

BEST COPY AVAILABLE

SUMMER SCIENCE CAMP AT CALIFORNIA STATE UNIVERSITY AT FRESNO

"Computer Literacy" and "Computer-Aided Design" are courses offered to the participants of the four-week residential **Summer Science Camp** held at **the California State University at Fresno.** The California State University at Fresno's School of Engineering received a three-year grant from the **National Science Foundation** in 1994 to hold an annual Summer Science Camp for 43 under represented middle school students. The Summer Science Camp program is designed to increase the numbers of these students pursuing careers in science, engineering, and math. It provides learning experiences to its participants in: 1) integrated coursework in algebra and geometry, 2) introduction to engineering concepts, 3) laboratory activities, 4) computer literacy classes, 5) computer-aided design, 6) refinement of communication skills, and 7) career exploration activities.

The four-week residential Summer Science Camp has two additional design components: a) The Academic Year Follow-Up, and b) a Project Assessment of both the summer and academic year follow-up programs.

The use of the **Mathematics Applications Curriculum for Science, Engineering and Technology Activities (MACSET)** in the Summer Science Camp assures the successful implementation of integrated math, science, and laboratory experiences. The hands-on experiences allow students to approach problem-solving by using practical applications to items found in everyday life, for example electrical appliances.

The MACSET curriculum engineering classes held participants' interests the most. The library research activity helps students in their research on careers in mathematics, sciences, and technology. Participants appreciate the exposure to state-of-the-art technological learning experiences, because these are not available at their local schools. Computer literacy helps to establish "pen pals" at other learning centers, and students enjoyed the e-mail network.

Field trips and guest speakers introduce the participants to careers in the field of sciences. Students are exposed to role models and receive mentoring support.

Academic year follow-up activities are directly linked with California State University at Fresno's "Mathematics, Engineering and Science Achievement (MESA) Program", a statewide program that addresses the need to increase the number of under represented students in pursuing college degrees in mathematics and sciences. **MESA** has chapters at several local high schools, providing in-school math and sciences clubs, Saturday Academies, academic advising, guest speakers, field trips, activities for parents, and tutoring services. •

"MACSET taught me how to use math in everyday life. We learn stuff that some high school kids don't even know!"

BEST COPY AVAILABLE

SUMMER PHYSICS ENRICHMENT CAMPS (SPECS) AT CALIFORNIA STATE UNIVERSITY AT HAYWARD

Students of the **"Summer Physics Enrichment Camps (SPECS)** are guided through an in-depth study of seven thematic units in physics: basic properties of matter, moving objects and mechanics, fluids, vibrations and sound, temperature and heat, electricity and magnetism, and light.

In 1994 the **National Science Foundation,** the **California State University at Hayward,** the New Haven Unified School District, and the Oakland Unified School District funded the "Summer Physics Enrichment Camps" (SPECS), a residential four-week Summer Science Camp program for 60 under represented 7th grade students held on the California State University at Hayward's campus. *Program Director Charlie Harper* describes SPECS' **goals** and specific objectives: **"...to provide a foundation for a lifelong interest in science and math and to encourage the consideration of math and sciences as... careers... to strengthen students' commitment to remain in school and complete their university entrance course requirements."**

While physics is the **curricular** focus, participants are also involved in library skills, basic mathematics knowledge, computer use, and communication skills improvement, along with astronomy, physics laboratory and outdoor experiments.

At the end of the program, students were asked, "Are you planning on attending college now?" 86% said, "Yes!"

Curriculum planning prior to the beginning of the Summer Science Camp program was fundamental to its success. The basic modes of instruction consist of hands-on experiments, demonstrations and lectures. The **staff** is formed by six middle school teachers along with university faculty. During the summer academic component, the 60 students are divided into four groups of 15 participants. Each group is under the supervision of a junior high/middle school science teacher.

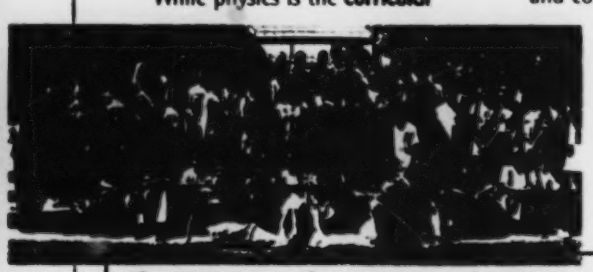
From 9 a.m. to 3:30 p.m., with breaks in between, each group receives classroom instruction, and is then involved in demonstrations, library, lab and computer activities in a university setting. Experiments like rocket and bridge building, side-by-side with wave experiments illustrate basic physics concepts, relating theory to real life events like, for example, the collapse of the Oakland Bay Bridge during 1989 Loma Prieta earthquake.

Late afternoon and four different types of evening activities give **parents** a chance to be a part of the Summer Science Camp program. Examples of these activities are: Family Physics, Astronomy Night, Physics Game Night, and workshops on university admission and financial aid information.

Field trips to the San Francisco Exploratorium, the Chabot Observatory and Science Center in Oakland, the Technology Museum of Innovations in San Jose further expose the students to careers in the field of sciences and role models.

During the **academic year follow-up activities**, students participate in a SPECS club at their schools, and summer program activities are continued once a month in a "Saturday College" format. Here, summer program graduates are enlisted in the outreach process for new participants, serving as their peer tutors. Parents and science teachers are encouraged to take part in these follow-up activities.

As a final note, when students were asked in the post-program evaluation survey: **"Are you planning on attending college now, after SPECS?" 86% said: "Yes!".** A measurable impact of the program and proof that the "Summer Physics Enrichment Camps" work! •



The 1995 group of participants in the "Summer Physics Enrichment Camps" on the California State University at Hayward Campus.

BEST COPY AVAILABLE

"KIDS INVENTING AND DISCOVERING SCIENCE" AT THE UNIVERSITY OF CALIFORNIA AT IRVINE

As part of an on-going project that was begun at the University of California at Irvine in 1990 to improve instruction for Mexican-American/ Latino school children in elementary schools in Southern California with funding from the Honda of America Foundation and the Chevron Corporation, the **University of California at Irvine** received funding from the **National Science Foundation** to conduct an intensive four-week commuter bilingual (Spanish - English) **Summer Science Camp** called: **"Kids Inventing and Discovering Science" (KIDS)** on the University of California at Irvine campus, serving 75 students in 7th, 8th, and 9th grade.

The KIDS Summer Science Camp is designed to help foster an understanding of fundamental science concepts, improve bilingual science curricula, provide appropriate role models to traditionally under represented students, and to increase parental involvement in children's science education.

The program emphasizes hands-on, active experimentation and exploration where the children take on the role of scientists. The **curriculum** focuses on Physics and Mathematics. The Summer Science Camp **staff** is provided by the Santa Ana School District's "Partnership for Reform in Science and Mathematics" (PRISM) project, assisted by graduate students in majoring in sciences and mathematics fields at the University of California at Irvine. The "KIDS" participants learn about topics like energy and momentum. Investigations of amusement park physics are complemented by a field trip to an amusement park in the fall. Other **field trips** take the students to places of scientific interest and local museums, for example the Museum of Science and Industry in Los Angeles and to the Electric Power Generation Station.

The KIDS Summer Science Camp also emphasizes **parental involvement**: A series of weekend events is scheduled for families to work together, and to make science rewarding and relevant to real life problems.

The **academic year follow-up activities** for the KIDS Summer Science Camp are undertaken in collaboration with the Santa Ana Unified School District's "Partnerships for Reform in Science and Mathematics" (PRISM) project, which is also funded by the National Science Foundation, and is part of the **"Comprehensive Partnership for Minority Science Achievement" (CPMSA)** program. The KIDS Summer Science Camp and the CPMSA program seek to extend and reinforce the ongoing science reform activities. •

The KIDS Summer Science Camp is designed to help foster an understanding of fundamental science concepts, improve bilingual science curricula, provide appropriate role models to traditionally under represented students, and to increase parental involvement in children's science education.

"KIDS" Summer Science Camp participants engrossed in a science lecture.

BEST COPY AVAILABLE

PROJECT OCEANS: OPPORTUNITIES TO CHALLENGE THE ENVIRONMENT AND THE NATURE OF SCIENCE

SUMMER SCIENCE CAMP AT LONG BEACH

Public school teacher Jacqueline Deamer contrasts the rich possibilities afforded by the **National Science Foundation** funded Summer Science Camp **"Project Oceans: Opportunities to Challenge The Environment and The Nature of Science"** with the more limited possibilities of public school science and math instruction and concludes: **"...Watching each individual's growth during the Summer Science Camp was an exceptionally satisfying experience. I regret that we will only be able to serve 120 students next summer in a diverse community including Long Beach and Los Angeles which offers very little math, science, and technology enrichment for middle school under represented students."**

The National Science Foundation Summer Science Camp "Project Oceans" has been a collaborative effort since 1995 between the **Long Beach Unified School District** and the Southern California Marine Institute serving 60 under represented middle school students from the Long Beach, Los Angeles, Lawndale, Compton, Inglewood, Torrance, and Palos Verdes school districts who have completed 6th, 7th, or 8th grade. Students are selected according to their interest in math and science, their records of attendance and conduct, and their completion of challenging academic programs.

The summer program consists of three different modules, hosted at three different sites. During the first two weeks of the six-week session, students attend a mini-institute in essential math and science skills, basic scientific concepts and computer usage. These basic mathematical and scientific concepts are drawn from the disciplines of marine biology, oceanography, coastal management, geology, and terrestrial ecology.

They then spend two weeks at the Southern California Marine Institute on Terminal Island in the Los Angeles Harbor. Here, the students learn to apply the previously studied scientific concepts within a marine-science context

through classroom and laboratory experiences and **field trip** exercises on one of the five research vessels at the disposal of the Institute.

The final two weeks are residential at the Wrigley Marine Science Center on Catalina Island. This period functions as an extended practicum, during which participants work on small-group research projects, study the marine flora and fauna by snorkeling every other day, perform laboratory work in chemical oceanography, and experience a whole variety of innovative learning activities. The students' knowledge of basic science concepts grows daily, and they begin to understand that they indeed need to identify the problems and be responsible for part of a solution.

Staff for the program include Long Beach Unified School District teachers, college instructors, and scientists from the Terminal Island Marine Institute. College students and high school seniors assist the staff in working with participants. They also serve as excellent role models. *Former high school Summer Science Camp assistant Misty Rose C. Borja* describes her experiences at "Project Oceans" and the positive impact it had on her own academic career: **"...The summer prior to my senior year of high school, I worked as a student assistant for 'Project Oceans'.... I was thrilled to participate in bringing the fun and excitement of math and science to other young students. When I was thirteen, I was accepted into the 'Young Scholars Ocean Science Institute' at California State University, Long Beach. That summer was the beginning of my enthusiasm and love of science. Since then I have ...participated in four other summer science programs.... I plan to enter a university next fall as a Marine Biology major."**

A former student assistant for the National Science Foundation "Project Oceans" recalls her experiential sciences education since she was thirteen years old and says, "I was accepted into the 'Young Scholars Ocean Science Institute' at California State University at Long Beach... since then I have exhausted the science opportunities found at my high school." These opportunities enabled her to plan to enter a university as a marine biologist!

Ten follow-up sessions are scheduled during the **academic year**, devoted to students producing "mini-documentaries" of their summer research experiences. Students are also encouraged to present their results at school district, and county science fairs, and seek funding for this purpose.

Dr. Lon McClanahan, Director of the Southern California Marine Institute, says about his involvement with and the success of "Project Oceans": **"...The Southern California Marine Institute has been involved in several educational efforts aimed at elementary, middle and high school students, but 'Project Oceans' was the most comprehensive of all these programs.... 'Project Oceans' greatly enhanced the participating students' scholastic skills, and greatly increased their problem solving abilities, as well as making math and science more approachable. The ongoing research projects have allowed the students to pursue their areas of interest while honing their academic skills.... The Southern California Marine Institute is proud to have participated in such an important and unique educational venture."** •

BEST COPY AVAILABLE

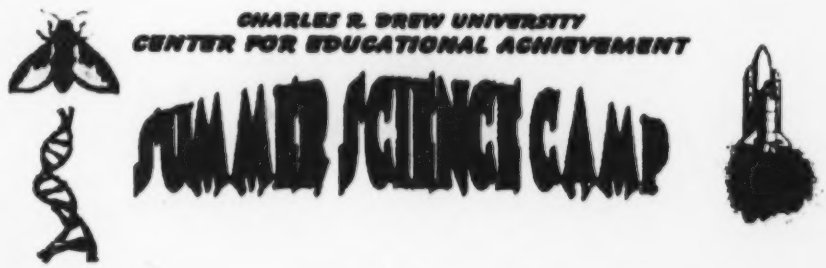
DREW SATURDAY SCIENCE ACADEMY SUMMER CAMP IN LOS ANGELES

"...The foundation for living and working in a technological age has to be laid early... To this end the Summer Science Camp Program sponsored by the National Science Foundation is a cost effective way to positively impact the long-term development of disadvantaged students in science, math, engineering, and technology."

Program Director Mary R. Blanding explains why there is a gap in school performance between under represented students, and their Anglo peers, and why this calls for intervention in the form of summer enrichment programs like the Summer Science Camp: **"...There are several reasons for this gap. In the cities of Los Angeles, Compton, Lynwood and L.A. County, under represented children are enrolled in schools that are in impoverished areas, where technical information is inadequate, resources are poor and role models scarce. These children often begin school without the skills required to succeed in the present system...Without adequate preparation, these students will continue to be eliminated from the possibility of becoming employed scientists, engineers, physicians, economists, or even productive citizens...The foundation for living and working in a technological age has to be laid early... To this end the Summer Science Camp Program sponsored by the National Science Foundation is a cost effective way to positively impact the long-term development of disadvantaged students in science, math, engineering, and technology."**

In 1995 the **National Science Foundation** funded the **"Drew Saturday Science Academy Summer Camp,"** a four-week residential science, engineering, math and technology enrichment program for 36 educationally disadvantaged 7th through 9th grade students in the greater South Central Los Angeles area to be held on the campus of California State University at Dominguez Hills, approximately five miles south of Drew University of Medicine and Science.

The program's main **goal** is to increase and improve the pool of qualified under represented students pursuing sciences, mathematics, engineering, and technology educational and career pathways. The "Drew Saturday Science Academy Summer Camp" seeks to raise the number of students who enroll and successfully complete Algebra 1 or Geometry as a prerequisite to more advanced high school and college preparatory mathematics sequences;



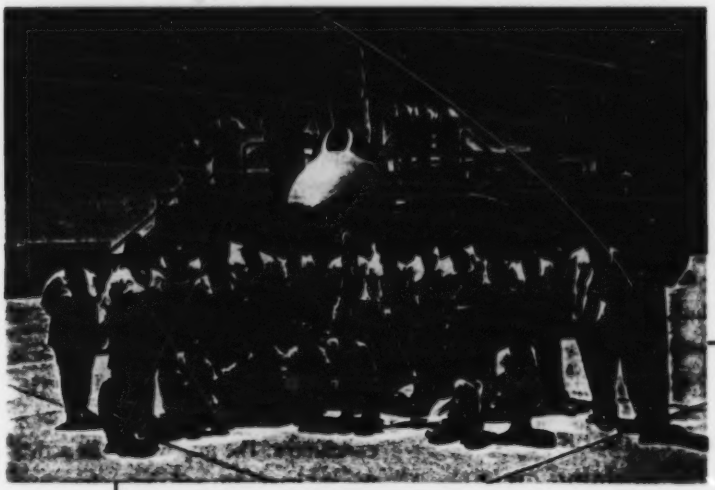
BEST COPY AVAILABLE

develop participants' computer skills and knowledge of scientific research modalities; increase parental knowledge and ability to assist students in mastering of science, mathematics, and technology; and increase awareness of career opportunities in sciences, engineering, mathematics, and technology professions.

Using the Active Learning Model as well as multi-level group interactions, the "Drew Saturday Science Academy Summer Camp" **curriculum** focuses on: Mathematics, Problem Solving, Critical Thinking, Scientific Observation and Analysis, and Reading Skills.

The science module is organized in themes, encompassing and connecting basic data and evidence of science in the areas of Energy, Evolution, Patterns of Change, Scale and Structure, Systems, Interaction, and Stability. The learning methodologies applied in the Summer Science Camp curriculum include self-directed learning, using student facilitators, scheduled group interactions, research design, hands-on learning activities, diagnostic tests, reading laboratory, and day trips.

Students are rotated through six major learning units on Mondays and Wednesdays: Research Methods, Virology, Biology of Flight, Aeronautics, Reading Comprehension, and Analytical Reasoning. Tuesdays and Thursdays Physics, Mathematics, Computers, and Science Research Projects make up the curriculum activities.



"Drew Saturday Science Academy Summer Camp" participants tour the U.S. Naval training school for Top Gun Airfighters in San Diego, California.

The learning units are complemented by **field trips** to the Museum of Flying, Six Flags Magic Mountain, and a visit to the California Institute of Technology, and mentoring sessions with professionals. Both activities permit the participants to gain first-hand experiences of careers in sciences, mathematics, and technology.

The core **Summer Science Camp faculty** consists of master teachers in sciences and mathematics, instructors from local universities, professionals from nearby industries, student assistants, and regular Saturday Science Academy faculty.

Parent participation is encouraged via orientation meetings, workshops, and conferences.

All Drew Saturday Science Academy Summer Science Camp participants continue in the regular, **academic year Saturday Science Academy**, which includes components like test preparation and study skills, and workshops in career planning. •

THE RESIDENTIAL INTENSIVE MATH AND SCIENCE ACADEMY (RIMSA) IN LOS ANGELES

California State University at Los Angeles reacted to the crisis caused by the extremely large numbers of students in the Los Angeles Unified School District by establishing alternative, year-round school calendars.

The students see first hand that they are capable of doing great things in their educational careers.

Program Director Jewel P. Cobb explains: **"...the Los Angeles Unified School District (LAUSD)...which has 639,000 students ...is the second largest district in the country...To deal with these kind of numbers, LAUSD uses alternative calendar, or year-round schools. This strategy splits the student population into three groups and has two groups attending school at any given time..."Residential Intensive Math and Science Academy" (RIMSA) is held in March and April ..., when 'B Track' students are out of school."**

The **National Science Foundation** funded Summer Science Program is a four-week **"Residential Intensive Math and Science Academy" (RIMSA)** for 50 high potential but average performing and economically disadvantaged 7th grade students from Los Angeles. The program's **goal** is to stimulate and encourage these students to take control of their academic lives and excel in education. It prepares them for college by providing a strong foundation for high school, especially in science and mathematics skills. The long-term **goal** is to reverse the downward spiral of college-going rates among low-income and under represented students.

The program offers mathematics, science, computer science and expressive writing instruction for curricular enrichment. The majority of the activities are hands-on and use an inquiry-based approach. Participants' cognitive skills are improved and their performance levels raised.

The mathematics curriculum follows the well known **"Algebra Project"**, assisting students to shift from arithmetic to algebraic thinking.

The science curriculum includes the following modules: The Environment, Water and Power, and Space Discovery, which follow the University of Wisconsin at Madison's sciences curriculum and the "Reaching for the Stars" curriculum developed by the U.S. Space Foundation. An additional module in Health Science focuses on adolescent health awareness, along with physical and emotional self-esteem.

A variety of **field trips** add creative, innovative, and reinforcing learning experiences to the program and are greatly enjoyed by the students. In the 1995 Summer Science Camp, most students named a boat trip on the ocean as their favorite field trip. The majority of these inner-city students had never been on the ocean before.

Parent participation is very high. Parents improve their own communication skills in workshops, and are encouraged and enabled to play an active role in their children's education.

After completion of the Summer Sciences and Math program all participants are academically monitored, and there are "RIMSA" **academic year follow-up** sessions scheduled on eight "Saturday Science Academies".

Program Director Jewel P. Cobb describes her approach and its success: **"...Instead of talking about the problems of low achievement in precollege math and science, we are tackling the problem through the activities of our center.... For our students to experience science and mathematics in a stimulating university environment, being led through their studies by working scientists, is a special opportunity. They will see first hand that they are capable of doing great things in their educational careers."** •

Students observe microscopic plant and animal life gathered on a field excursion to the Los Angeles harbor.

BEST COPY AVAILABLE

SUMMER SCIENCE CAMP AT THE UNIVERSITY OF CALIFORNIA AT LOS ANGELES

The School of Engineering and Applied Science at the **University of California at Los Angeles,** the Los Angeles Unified School District Urban Systemic Initiative, and the Howard Hughes Medical Institute are matching funds with the **National Science Foundation** to offer a six-week commuter Summer Science Camp for 40 under represented 8th and 9th grade high-potential students attending schools within the Los Angeles Unified School District.

The Summer Science Camp's **goals** are to build a community of students who emerge better prepared for and firmly interested in pursuing careers in the sciences, engineering, and math professions, to enhance students' understanding of the interrelations of math, science, and technology to real world applications, and to create an interactive learning environment that promotes scientific inquiry, hands-on investigations, and peer collaboration.

The program's instructional activities focus on mathematics, where students are introduced to non-traditional concepts of algebra and geometry, and engage in computer exercises in collaborative problem-solving workshops. The science activities center on two project modules: rocketry and sea vessels. These science projects form the thematic focus for exploring applications in physics, algebraic geometry, and technology. Both projects engage students in class discussions, laboratory workshops, faculty demonstrations, field excursions, and research methods relevant to the respective student science research project.

A two-day residential stay at the campus dorm is part of the Summer Science Camp activities, exposing the participants to the "life of a college student".

The project **staff** brings together University faculty, undergraduate and graduate engineering students who act as mentors for the young participants.

Field trips to the Jet Propulsion Lab, the GM Hughes Electric Car Lab, and the South Coast Air Quality Management District are part of the Summer Science Camp's activities.

Community involvement is planned with members from local industries participating in the classroom activities and providing career information as guest speakers. Professional scientists and mathematicians serve as role models to the Summer Science Camp participants during the "Career Day".

Parent involvement is achieved via a "Parent Conference" held during the summer program. In the **academic year**, a series of "Parent Leadership Workshops" complements the twelve Saturday Academy Program sessions available for participants. Students are encouraged to enroll in other precollege and university-level mathematics and sciences programs sponsored by the University of California at Los Angeles School of Engineering, where they receive homework assistance and tutoring services, and their academic performance and interest in course selection is tracked. •

The science activities center on two project modules: rocketry and sea vessels. These science projects form the thematic focus for exploring applications in physics, algebraic geometry, and technology.

BEST COPY AVAILABLE

"PROJECT WATER" SUMMER SCIENCE CAMP IN MODESTO

The theme of "Water", its multitude of uses and how it impacts our daily lives is the focus of all learning activities that take place at the Neal E. Wade Outdoor Education Center owned by the **Stanislaus County Office of Education** in California.

In order to increase the numbers of under represented students in careers in math and sciences, the **National Science Foundation** awarded funding to the Stanislaus County Office of Education to provide a four-week **"Project Water" Summer Science Camp** for 50 under represented middle school students in 1994.

The **curricular focus** of "Project Water" is on the theme of water. The **goals** of this Summer Science Camp are to strengthen student commitment to remain in school, to emphasize the importance of mathematics, sciences, and communication skills in their daily lives, to expose students to a range of participatory activities in sciences and mathematics, to introduce them to the research process, career exploration and information in these fields, and to see these areas as potential career choices. The "Project Water" Summer Science Camp residential program stresses critical thinking skills, cooperative learning models, computer experiences, and individual responsibility as means of group development.

Students are housed in the Neal E. Wade Outdoor Education Center located in the Sierra foothills, an area rich in geological features, specimens, and fossils, where there is ample opportunity to investigate environmental issues and visit facilities of scientific interest.

The "Project Water" Summer Science Camp residential program stresses critical thinking skills, cooperative learning models, computer experience, and individual responsibility as means of group development.

Participants are welcomed to the program, along with their parents, in an informational evening organized by the **staff** of university faculty, public school science teachers, graduate student counselors and professional naturalists.

BEST COPY AVAILABLE

As previously indicated, the Summer Science Camp content curriculum focuses on the theme of "water", water resources and its effects on human life, water pressure and density. During the first week the students conduct regional studies in small groups. Soil and water samples are examined with scientific instruments. Geology, elements of water, and properties of the water cycle are studied. Forest management and water usage in the Tuolomne County region are discussed with professional Forest Rangers, who speak to the participants about careers in the field of conservation. During the second week, participants explore Moaning Cave by rappelling and crawling through the various cave passages. They also explore the different natural formations of a creek as it meanders underground. The third and fourth week of the Summer Science Camp are highlighted by two unique educational **field trips**: 1) The twelve mile white water river rafting expedition down the Merced River to study river formations, water flow and pressure, and 2) A visit to Yosemite National Park, where students receive information on the history, geography, and geology of the Yosemite Valley. Here, participants observe the various rock formations, water falls, flora and fauna.

Goals of the Summer Science camp include: strengthening student commitment to remain in school, emphasizing the importance of mathematics, sciences, and communication skills, introducing students to the research process, and stressing these areas as potential career choices.

Career exploration in the field of math and sciences is provided during scheduled tours of the California State University's Biology and Physical Sciences Departments.

Field trips to the Turlock Irrigation Plant and the Lawrence Livermore Hall of Science at the University of California at Berkeley are planned to enhance the "Project Water" Summer Science Camp, and contribute to increase the students' knowledge of domestic water use, water as a source of power, principles of water flow, and the water sanitation process.

A special awards ceremony concludes the "Project Water" Summer Science Camp, with **parents** attending the "Family Science Fair".

During the **academic year follow-up activities** participants are encouraged to continue to work on these water research projects and ultimately to enter them in regional science fairs and olympiads. •

BEST COPY AVAILABLE

PRE-COLLEGIATE ACADEMY SUMMER SCIENCE CAMP IN OAKLAND

The **East Bay Consortium, Inc.**, a collaboration of 19 Oakland, California area schools, colleges and universities, has conducted the commuter **"Pre-Collegiate Academy"** through the **National Science Foundation**'s Summer Science Camp program since 1994. This five-week project serves 50 under represented 7th and 8th grade students from seven schools in a severely educationally and economically disadvantaged area of Southeast Oakland. The program site is Merritt College's campus.

The program's **goal** is to increase the number of Oakland students finishing high school and enrolling in colleges of their choices.

The Summer Science Camp's disciplinary focus is on mathematics. Students are split up into morning classes of about 25 instructed by a **staff** of high and middle school teachers; graduate students, and older high school students serve as peer role models and mentors to the participants.

The **curriculum** is designed according to a hands-on, cooperative problem solving and project oriented approach. Project themes are adapted to the participants' interests and their surrounding environments. In the 1995 Summer Science Camp, project themes in the curriculum included: the Loma Prieta earthquake and the accompanying collapse of the freeway, Berkeley fires, and the economic potential of San Francisco Bay.

"As a teacher, I have witnessed first hand the positive effects of its approach in getting at-risk inner-city youth, firmly and decisively settled on the academic track. We are encouraged to see young people interested in, motivated toward, and identified with an academic career."

Twice a week, participants enroll in activities like college information workshops to increase their motivation toward mathematics and sciences majors in college and careers in these fields.

Classroom activities are also complemented by **field trips** throughout the Oakland area. A highlight of the summer session is the two-and-a-half-day ecological camping expedition to Pinnacles National Monument, sponsored by Naturalists at Large, who provide on-site explanations and guidance.

Pre-Collegiate Academy teacher Wajibu Green explains how the program supplements the public school system: **" ...This ...summer program has ...provided valuable experience and training for teachers. We have developed and taught a curriculum which conforms to the new state framework and the NCTM standards. The same curriculum and materials are used during the academic year to improve the mathematics program of the schools. ... This program should not only be continued, but expanded and duplicated in order to improve math instruction in Oakland."**

Parents are encouraged to participate with their sons and daughters in **follow-up activities during the academic year**, which include Saturday programs, Family Math And Science, after-school tutoring, and a science club.

Pre-Collegiate Academy Program teacher Giusseppe Rensi gives his full support to the program: **"...I would strongly urge you to maintain and expand the funding for this program. As a teacher, closely connected with the program, I have witnessed first hand the positive effects of its approach in getting at-risk inner-city youth, firmly and decisively settled on the academic track. ... We are encouraged and thrilled to see young people interested in, motivated toward, and identified with an academic career. We have seen many improve their grade point average in their schools through the help, tutoring, and positive identification with academic proficiency developed through contact with our program."** •

BEST COPY AVAILABLE

AMERICAN INDIAN SUMMER SCIENCE ACADEMY

AT CALIFORNIA POLYTECHNIC STATE UNIVERSITY AT SAN LUIS OBISPO

Funded by the **National Science Foundation** from 1992 to 1995, the residential **"American Indian Summer Science Academy" (AISSA)** program has provided 50 under represented students entering 7th and 8th grade with a one-week Outdoor Science Education component, followed by a one-week University Component at **California Polytechnic State University at San Luis Obispo.**

"The key to planning for future generations is keeping the options open: Today's generation can't make all the decisions for what will happen to earth. The generations to come must have choices, too."

The Outdoor Science Education Component allows participants to study the natural environment in an outdoor setting at the Big Rock Creek Camp in the San Gabriel Mountains of Los Angeles County. During this one week program, students are exposed to hands-on learning experiences in the subjects of astronomy, physics, chemistry, and mathematics; all taught by California Polytechnic State University **staff**. The main science project is straw bale construction. The construction site is near the Tassajare Creek Homes area. A *local solar contractor* assists the students with their project by explaining the building process. He states: **"...the key to planning for future generations is keeping the options open: Today's generation can't make all the decisions for what will happen to earth. The generations to come must have choices, too."**

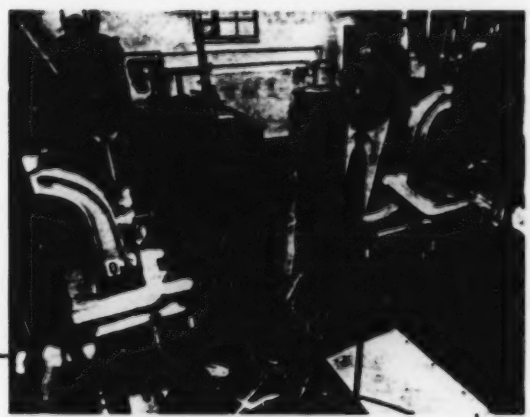
The University Component of the Summer Science Camp is designed similar to the Outdoor Science Component. The students complete group science projects and attend special cultural awareness presentations. Field observation, research, career education, and classroom instruction contribute to increase the level of interest in mathematics and science for all participants.

A variety of **follow-up activities** are conducted by **MESA** and the **"Success through Collaboration" (STC)** programs, which, in partnership with the Indian Education Centers, designate a mathematics or science teacher from a local school district to assist the Summer Science Camp participants throughout the academic year. These follow-up activities include monthly science academy meetings, field trips, career exploration, guest speakers, and academic planning sessions. •

BEST COPY AVAILABLE

SUMMER SCIENCE CAMP AT THE STATE UNIVERSITY OF CALIFORNIA AT SACRAMENTO

Beginning in 1995, sixty-five under represented 6th through 9th grade students from nine school districts in the Greater Sacramento Area in California have the opportunity to participate in the five-week commuter **National Science Foundation Summer Science Camp** designed by the **State University of California at Sacramento's MESA program**, and held on the **California State University at Sacramento** campus. In addition to the National Science Foundation funding, extensive resources have been secured from local industries, school districts, the Capitol Center MESA university sponsors, the University of California at Davis, the College of Engineering, the State University of California at Sacramento School of Engineering, and the Dwight D. Eisenhower Mathematics and Science Teacher Training Grant, revealing the community and business belief in supporting early education projects to stimulate the young participants' success during their school years.



An opportunity for science laboratory explorations and studies at the State University of California at Sacramento

The MESA program's network brings participants from nearly 40 schools who have potential in science and math, and an interest in exploring science and math careers to attend the Summer Science Camp at the State University of California at Sacramento. Local high-tech industries see this grouping as a unique occasion to introduce themselves to these middle school students as future employers by offering weekly mentoring sessions and extensive career exploration.

The participants and their **parents** are welcomed into the Summer Science Camp with an orientation session one week prior to the program start. Parents ride the bus that students use daily, visit the State University of California at Sacramento campus, sit in the classrooms, meet the instructors, and have a chance to ask questions about the program.

A typical day in the Sacramento Area MESA 1995 Summer Science Camp begins with academic morning classes, afternoon science lab sessions, and job shadowing. This commuter program stresses the core mathematics and science topics and offers computer science instruction, laboratory experience, field study tours, intensive math preparation, PSAT test preparation, and language skills development to all participants according to a daily schedule.

Students particularly enjoy the opportunity to supplement their classroom learning with a large number of **field trips** that show the connections between mathematics and sciences concepts and the application of knowledge in these fields in a professional environment. Examples of field trip locations are the Lake Tahoe Basin Conservancy Erosion Control Project, the Monterey Bay Aquarium ecological study ponds, the United Airlines maintenance facility at San Francisco International Airport, and the NASA Space Center at Moffitt Field and the San Francisco Academy of Sciences.

The Summer Science Camp has several **academic year follow-up** components: after-school meetings, leadership workshops sponsored by the College of Engineering at the University of California at Davis campus, and a 15-meeting Saturday Academy held in a research setting at University of California at Davis.

Students particularly enjoy the opportunity to supplement their classroom learning with a large number of field trips that show the connections between mathematics concepts and the application of knowledge in these fields in a professional environment.

"...Parents, students, and instructors are positive about the benefits of the Summer Science Camp experience.... they were particularly enthusiastic about the quality of the math courses and the range of field trip experiences...," says *Program Director Dr. James Harold.* •

BEST COPY AVAILABLE

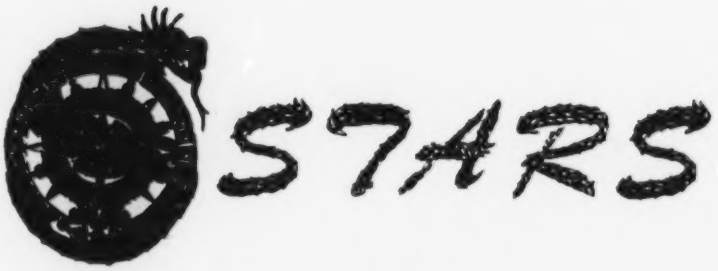
SUMMER SCIENCE AND TECHNOLOGY TO ADVANCE RESEARCH SKILLS (SSTARS) AT SAN DIEGO STATE UNIVERSITY IN CALIFORNIA

Students work in teams on research and model building projects. A five-day wilderness retreat reinforces these team building activities, supported by a staff of teachers and counselors.

The **National Science Foundation** has sponsored a four-week residential Summer Science Camp hosted for the first time on **San Diego State University's campus** for 50 8th grade under represented students from five target schools in San Diego County since 1993. The **"Summer Science and Technology to Advance Research Skills" Program (SSTARS)** is designed to inspire and instruct students in the fields of math, science, and computer science in an integrated curriculum adapted to these students' needs and the San Diego area topography.

The SSTARS program attempts to prepare its participants for advanced level high school courses in math and sciences, and ultimately tries to encourage and prepare them for careers in these fields. Science and technology professionals from the San Diego area make presentations to serve this purpose. Career workshops and visits to local industries expose the program participants to the many exciting career opportunities in the field of sciences.

Program Director Dr. Cynthia Parks describes the SSTARS **curriculum**: Math, geology and computer classes keep participants learning every day in the Summer Science Camp program. In the math track, students learn about the English Channel Tunnel constructed in Europe, and use their knowledge of geometry to estimate the total volume of its three tunnels, and how much dirt was removed from the earth to make them. Links with science include problems in soil mechanics and geology. The geology course centers around themes dealing with natural disasters, requiring knowledge of plate tectonics and earthquakes. Then, mathematics and geology are linked through calculations of geological time periods, rock density, and fossil and rock carbon dating. In the computer track, students take their knowledge of earthquakes, meteorology, and erosion processes learned in the geology track and work with earthquake hypercard stacks, weather maps on-line, and computer drawings of simulation erosion processes. Field trips to such geological sites as the eroded cliffs of La Jolla beach and the uncommon cliff stratifications of Tourmaline Beach reinforce the classroom work.



Other carefully selected **field trips** to several distinct geological sites like the Tijuana Estuary are included in the program activities which apply the newly acquired knowledge to real world situations.

Students also work in teams on research and model building projects. A five-day wilderness retreat reinforces these team building activities, supported by a **staff** of teachers and counselors.

During the **academic year** SSTARS participants meet weekly with their home school teachers for further academic enhancement and counseling. Peer counselors from the **Talent Search Program**, a federal funded program serving middle school students, also assist participants in the academic year. SSTARS participants are encouraged to continue their math and science education at either the **Upward Bound Math-Science Regional Center**, a federal educational program aimed at increasing high school students' interest in math and sciences, or the **Young Scholars Program**, a National Science Foundation funded program. The presence of these other math and sciences pre-college enrichment programs guarantees the continued enhancement of the Summer Science Camp participants' academic math and sciences preparation. •

The "Summer Science and Technology to Advance Research Skills" Program (SSTARS) is designed to inspire and instruct students in the fields of math, science, and computer science in an integrated curriculum adapted to these students' needs and the San Diego area topography.

"SSTARS" Summer Science Camp participants have the opportunity to study the geology of the cliffs at Tourmaline Beach in La Jolla, California.

BEST COPY AVAILABLE

YOUNG ENGINEERS AND SCIENTISTS [Y.E.S.] SUMMER SCIENCE CAMP AT SAN FRANCISCO STATE UNIVERSITY

A grant from the **National Science Foundation** enabled **San Francisco State University** and the **"Mathematics, Engineering, Science Achievement" (MESA) Program** to conduct a six-week commuter Summer Science Camp, called **"Young Engineers and Scientists"(Y.E.S.)**, serving 70 under represented students in 7th through 9th grade, selected according to academic potential, teacher and community recommendations, a written application, and an expressed interest in learning about science, engineering or mathematics from four schools: Ronald McNair Intermediate, James Flood Elementary, Menlo-Atherton High, and Sequoia High School.

The "Y.E.S." program's **objectives** are: to introduce students to science, engineering, and mathematics concepts in a culturally relevant manner; to teach students how their academic coursework, and especially, how science, engineering, and mathematics relate to the world around them and to their futures; and to help parents become better informed and actively involved in the education of their children.

This summer program includes in the morning: science, computer science, mathematics, and communication courses. In the afternoon, science and pre-engineering activities like guest speakers, laboratory work, field trips and group science research projects scheduled for the participants.

The intensive **curriculum** comprises of theory and hands-on activities in biology/life science, engineering, astronomy, chemistry, earth science/geology, physics, social sciences, communications, mathematics, and computer sciences. Students build towers, bridges, and oil derricks using paper, toothpicks or popsicle sticks. They increase their sensitivity to building materials, stress levels of materials and fatigue, and then compete with these sciences projects in the "Northern California Math and Science Competition Day", and are thus involved in the real life tasks of a working scientist.

The "Y.E.S." **staff** of teachers and mentors from the industry sector is complemented by undergraduate students from the "Minority Engineering Program" at the University of California at Berkeley and San Francisco State University, who work with the Summer Science Camp participants and serve as role models.

Educational **field trips** are scheduled to sites of scientific interest: Students visit the IBM and Hewlett-Packard computer companies, and NASA.

Parents are strongly encouraged to become involved in the Summer Science Camp program, and ultimately their children's education.The attendance of "Parent Workshops" is required!

The "Y.E.S." summer program ends with an awards ceremony for participants, staff, and parents.

"...All components of the Summer Science Camp project were successful in creating access to, supporting, and retaining Summer Science Camp students in the Summer Science Camp project and in the educational pipeline."

A thirty-two week **academic year follow-up program** enrolls the Summer Science Camp students in the existing MESA programs at their respective home schools. All participants meet weekly during the school year and receive elective credit. These sessions continue to reinforce mathematics and sciences concepts, and provide additional hands-on experiences in these fields. The academic year component also continues to provide academic and career counseling services for the Summer Science Camp participants.

The Annual Progress Report in 1994 concludes: "...All components of the Summer Science Camp project were successful in creating access to, supporting, and retaining Summer Science Camp students in the Summer Science Camp project and in the educational pipeline." •

BEST COPY AVAILABLE

MENTORING STUDENTS IN MATHEMATICS AND SCIENCE AT SAN MARCOS

(MS)²(SM) IN CALIFORNIA

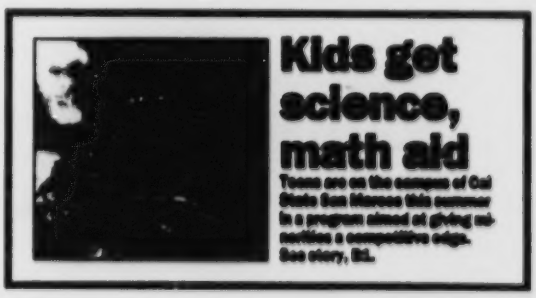
A grant from the **National Science Foundation** has allowed **California State University at San Marcos** to provide under represented students in 7th, 8th, 9th, and 10th grade with the opportunity to participate in its four-week commuter Summer Science Camp **"Mentoring Students in Mathematics and Science at San Marcos" (MS)²(SM)** from 1993 to 1995. Every summer 50 middle school students are selected to participate in the program; program graduates from the previous summer return for more advanced and demanding instructional activities.

Principal Investigator Dr. Carolyn Mahoney states her program goals: **"...The 'Mentoring Students in Mathematics and Science at San Marcos' (MS)²(SM) program offers activities that develop a 'can do' attitude and approach to mathematics and science in the selected students.... Familiarity with some of the technology ...should ease their transition to high school and to their science and mathematics classroom experience.... (MS)²(SM) emphasizes to students and their families the importance of good grades, college preparatory curriculum, good study habits, and the relationship of school to career."**

The "Mentoring Students in Mathematics and Science at San Marcos" Summer Science Camp program benefits from a large number of supporters: Parents, community members, school personnel, faculty, administration, and staff at both Palomar College and the California State University of San Marcos, area businesses, the Corporation for National and Community Service, the Mathematical Association of America, and the State of California Pipeline Project - all generously contribute to the Summer Science Camp program's success.

Ernest E. Zomalt, Vice President of Student Affairs at California State University at San Marcos, voices his support for the (MS)²(SM) Summer Science Camp program: **"...I believe the Math Summer Camp concept is an essential component of our total early outreach effort to our local schools.... Our program provides a supportive structure for these students including role modeling and tutorial assistance. Programs like the Math Summer Camp provide an academic focus within this general outreach concept which is so desperately needed."**

The instructional **staff** of the (MS)²(SM) program includes a variety of research and educational personnel: precollege teachers, community college instructors, and university professors. College students act as classroom assistants, tutors, and mentors. The Summer Science Camp was designed by mathematics professor Dr. Carolyn Mahoney, who planned and implemented the mathematics component of The Ohio State University's "Young Scholars Program", a highly successful year-round intervention program.



Kids get science, math aid

Teens are on the campus of Cal State San Marcos this summer in a program aimed at giving students a competitive edge. See story, B2.

The core **curriculum** of the Summer Science Camp consists of three integrated components: "Writing", "Mathematics", and the "Sciences". Four days of each week, students are rotated through classes according to their grade levels (7th, 8th, 9th, and 10th). The "Writing" component of the Summer Science Camp takes place in the computer laboratories. Students are introduced to creative writing skills, computer/word processing competency, and developing an

BEST COPY AVAILABLE

MENTORING STUDENTS IN MATHEMATICS AND SCIENCE AT SAN MARCOS IN CALIFORNIA

understanding of and appreciation for diversity of the world. All students participate in the creation of a weekly newsletter.

The "Mathematics" classes expose students to traditional and non-traditional mathematics according to their grade level and in a discovery-based, collaborative environment that utilizes graphing calculators, computer software, and the Internet as tools to enhance learning.

The 7th grade participants study area, perimeter, volume, and spatial visualization, problem solving, and pattern recognition using tiles, blocks, and the TI-82 calculator, learning how to graph, store , record, and analyze data.

The 8th grade math curriculum consists of the graph theory section and functions and graphs, where students model and solve real world problems in innovative ways.

Probability and statistics are the topics in the 9th grade; and the 10th grade participants are introduced to matrices and matrix manipulation.

The "Science" module introduces students to the connections that exist among the various disciplines of science, and enables them to understand the rapidly changing world of technology.

The 7th grade students are introduced to physics using the "Teaching Integrated Mathematics and Science Project" (TIMS) developed at the University of Illinois at Chicago. Students learn physical scientific facts related to matter, reactions and interactions, force and motion, and energy.

The 8th grade participants enroll in a "Planetary Science" class, learning about the solar system through discovery activities using digital image processing software developed at the University of Arizona, and activities involving hands-on constructions.

The 9th grade students explore four main topics in biology: Life through a Microscope; Life in the Ocean; The Human Body; and the Life Cycle of the Painted Lady Butterfly.

Molecular biology is the topic of the 10th grade science component. Students study DNA and its encoding. They remove chromosomes from Drosophila fruit flies under a dissecting microscope, and extract DNA from an onion.

Participants attend elective classes in the afternoon.

Each of the four weeks of the summer program is organized around a central topic. The themes and content of the program permeate and are reinforced by weekly field trips, career exploration, elective courses, and recreational activities. All field trips are targeted to the different grade levels. Students visit the Challenger Space Center, the Stephen Birch Aquarium, the Blue Sky Ecological Reserve, the San Diego Wild Animal Park, the ARCO Olympic Training Center, and Knotts Berry Farm Amusement Park.

> "...Our program provides a supportive structure for these students including role modeling and tutorial assistance. Programs like the Math Summer Camp provide an academic focus within this general outreach concept which is so desperately needed."

During the **academic year**, Summer Science Camp participants meet on Saturdays at Palomar College; academic, cultural and recreational activities are planned. Throughout the academic school year the Summer Science Camp staff visits the respective home schools to talk with principals and counselors to learn about the students' progress.

California State University President Bill W. Stacy writes in his letter of support to Summer Science Camp Principal Investigator Dr. Carolyn Mahoney: **"...I am pleased with your math summer camp proposal ...As you know, you and I have discussed the history of declining enrollments in math and sciences by students nationwide... This proposal is an important element in trying to change that history. I strongly encourage its submission to the National Science Foundation."** •

SEASIDE JUNIOR HIGH SCHOOL MATH/SCIENCE INSTITUTE

SUMMER SCIENCE CAMP

AT THE UNIVERSITY OF CALIFORNIA AT SANTA CRUZ

In 1995 the **University of California at Santa Cruz** offered a successful "Junior High School Math/Science Institute", a privately funded summer program, to 16 under represented students selected from the Monterey Peninsula Unified School District. The drastically improved post-program school grades accounted for the wish to extend the program services to a larger group of students.

With a grant from the **National Science Foundation**, a four-week residential **"Seaside Junior High School Math and Science Institute"** Summer Science Camp is held at the University of California at Santa Cruz, encouraging 40 under represented students to successfully complete advanced math and sciences courses in high school, to attend college, and to enroll in math and sciences careers.

The Summer Science Camp's **goals** are: to provide these middle school students with academic enrichment activities to enhance their understanding of scientific and mathematical concepts, augmented by laboratory and field research projects; to create opportunities for interaction with faculty recognized as leaders in marine and related sciences and mathematics; to provide instruction in state-of-the-art information access and year-round follow-up academic and career development support services.

The newly developed Summer Science Camp **curriculum** focuses on Marine Science and Natural History. The disciplines of Astronomy, Chemistry, Computer Science, English, Mathematics, and Physics are also integrated into the curriculum through a variety of field research projects, tutorials, as well as classroom and hands-on lab activities. The Summer Science Camp draws upon the students' own experiences to engage them in sciences and mathematics, and to challenge their preconceptions of the marine environment. Special emphasis is placed on "doing science" before hearing explanations, on understanding before learning terminology. Each discipline covers four modules. For example: In Physics, lessons in Force, Energy, and Electricity are complemented by a field trip to the San Francisco Exploratorium. The tutorials provide all students with an enhancement of their study skills and academic advising related to mathematics and sciences.

A **staff** of recognized educators, researchers, and scientists is assisted in its instructional and guidance efforts by graduate and undergraduate students acting as mentors and role models to the younger program participants.

Field trips to science museums, educational organizations, and a boat trip on a research vessel provide additional exposure to the exciting world of science and its many career options.

Participants and **parents** receive sciences and math academic and career information via workshops that acquaint them with various educational opportunities, university admissions procedures, and financial aid possibilities to secure the participants' choices toward colleges.

The students are provided with additional academic and career counseling and academic support services during the **academic year follow-up program.**

The "Seaside Junior High School Math/Science Institute" Summer Science Camp program secured additional support and assistance from the the "Advancement Via Individual Determination" program of the Monterey Peninsula Unified School District. Its *coordinator Morris Joseph* pledges: **"...This is to confirm that the 'Advancement Via Individual Determination' program is anxious to collaborate ...on this first Summer Science Camp. We applaud ...efforts to secure funding from the National Science Foundation to provide a real opportunity for these disadvantaged students to live on a college campus while acquiring the skills so necessary for reaching their academic goals."** •

"...Special emphasis is placed on "doing science" before hearing explanations, on understanding before learning terminology."

BEST COPY AVAILABLE

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
University of California at Berkeley, California	60	6 weeks	7, 8, 9	1, 2, 3, 4, 5, 7, 8, 9, 10
California State University at Chico, California	50	4 weeks	7, 8, 9	1, 2, 3, 4, 6, 7, 8, 9, 10
Harvey Mudd College, at Claremont, California	58	5 weeks	7,8	1, 2, 3, 4, 5 6, 7, 8, 9, 10
California State University at Dominguez Hills, California	80	3 weeks	6, 7, 8	1, 2, 4, 6, 7, 9
California State University at Fresno, California	48	4 weeks	7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
California State University at Hayward, California	60	4 weeks	7	1, 2, 3, 4, 6 7, 8, 9, 10
University of California at Irvine, California	60	4 weeks	7, 8, 9	1, 2, 4, 5, 6 7, 8, 9, 10
Long Beach Unified School District, Long Beach, California	60	6 weeks	6, 7, 8	1, 2, 5, 6, 7 8, 9
Drew University of Medicine and Science, Los Angeles, California	36	4 weeks	7, 8, 9	1, 2, 3, 4, 5 6, 7, 8, 9, 10
California State University at Los Angeles, California	50	4 weeks	7	1, 2, 3, 4, 5 6, 8, 9, 10
University of California at Los Angeles, California	40	6 weeks	8, 9	1, 2, 4, 6, 7 8, 9, 10
Stanislaus County Office of Education, Modesto, California	50	4 weeks	8	1, 2, 4, 5, 6 7, 8, 9, 10
East Bay Consortium of Education, Oakland, California	54	5 weeks	7, 8	1, 2, 3, 6, 7 8, 9, 10
California Polytechnic State University at San Luis Obispo, California	50	4 weeks	7, 8	1, 2, 3, 4, 5 6, 7, 8, 9, 10
California State University at Sacramento, California	74	5 weeks	6, 7, 8, 9	1, 2, 3, 4, 5 6, 7, 8, 9, 10
San Diego State University, California	50	4 weeks	8	1, 2, 3, 4, 6 7, 8, 9, 10
San Francisco State University, California	65	6 weeks	7, 8, 9	1, 2, 3, 4, 5 7, 8, 9, 10
California State University at San Marcos, California	50	4 weeks	6	1, 2, 3, 4, 6 7, 8, 9
University of California at Santa Cruz, California	40	2 weeks	7, 8	1, 2, 3, 4, 6 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

M3 SUMMER CAMP FOR SCIENCE AND MATHEMATICS: MASTER, MAINTAIN, MATRICULATE PROGRAM IN COLORADO

Funding from the **National Science Foundation** in 1994 enabled the **American Indian Science and Engineering Society** (AISES) to sponsor the **"M 3 Summer Camp for Science and Mathematics: Master, Maintain, Matriculate"** program, bringing together 42 under represented 8th grade students depicting 12 tribes from three geographic regions: the Great Lakes, the Southwest, and the Southeastern United States.

The **goal** of the M3 Summer Science Camp is to foster and encourage these under represented students' understanding, development and use of science and mathematics to **master** and **maintain** their skills in these fields. The long-term goal is an increase in the number of under represented students **matriculating** in college in science, engineering and math, and persisting in these majors through to graduation to enter careers in these fields.

"...In our summer academic programs, curriculum material and subject matter is relevant and culture-based," says *Cathy Abeita, Director of AISES Pre-College Programs.* **"...We try to provide our students with a hands-on learning experience that is meaningful to them, help students make connections, and most importantly, recognize the students for their participation and progress in science and math."**

Students are selected in pairs from the three regions of the country: Southwest, Southeast, and Great Lakes. The Summer Science Camp **curriculum** program has three components: 1) Fifteen days of intense academic math and sciences classes, and development of an ongoing research project at St. Norbert College; 2) regional follow-up sessions link students for five days with their peers, schools, mentors, and corporate sites in each of the three regions, and they continue to develop their research projects; 3) academic year follow-up activities conducted through network linkages maintain and strengthen the students' interest levels and research projects in math and sciences.

Incoming 8th grade students are welcomed to the program with a mini powwow, social dancing and a traditional Oneida dinner. They spend 15 days of

Students explore equipment on a unique foresting field trip to the Menominee Indian Reservation.

The 1995 group of students at one of the program sites, St. Norbert College in DePere, Wisconsin

the summer program at St. Norbert College in DePere, Wisconsin, attending classes in computer science, botany, Science of Alcohol Curriculum for American Indians, environmental science, chemistry, mathematics, physics, and rocketry. The math curriculum includes problem solving, communication and reasoning skills development, as well as algebra and geometry. In science labs, students learn research methodology, and use mathematical techniques and tools to explore the real world around them. Technology applications provide students with the opportunity to interact with each other, the instructors, and professional mentors via the Internet.

Field trips include visits to the Menominee Indian Reservation to learn about forestry careers, to the logging camp, the Crane Foundation, to Miracle - the white buffalo calf -, and a tour of the Milwaukee Museum.

The **staff** consists of American Indian instructors, including professors and middle school teachers. In addition to serving as role models, several American Indian college students also work as teaching assistants and mentors.

The program continues with regional, week-long follow-up sessions near the respective hometown of the participants at Sandia National Laboratories in Albuquerque, NM, Pembroke State University in Pembroke, NC and St. Norbert College in DePere, WI. Activities here closely link students with their respective schools and their advisors.

During the **academic year** participants, along with their **parents**, are placed with local scientists and engineers, who mentor the students. **"...The goal is for the students, with the aid of a resource person, to create a science research project to present in local, regional, and national science fairs. Each student was assigned an e-mail address so that they can keep in touch with each other and their mentor,"** says *instructor Victor Pedro.*

The program is working. Students who have attended at least three AISES Summer Science Camp programs show a higher retention rate in high school, 90% versus 64% of American Indians nationally. Out of these 90% who graduate from high school, 90% go on to higher education!

"...Nationally, I'm seeing more American Indians going into sciences," says *Dr. Joe Coulter, professor and chair of the Neuroscience Program at the University of Iowa.* **"...I think a lot of it is directly related to middle and high school outreach programs like AISES and efforts made by tribal communities to further the higher education of their people."**

> "...We try to provide our students with a hands-on learning experience that is meaningful to them, help students make connections, and most importantly, recognize the students for their participation and progress in science and math."

Program Director Cathy Abeita explains the particular success of the "M3 Summer Science Camp": **"...Students tell us they like the relaxed learning environment of the program. They enjoy getting to know their instructors as real people, being challenged to grow, solving problems, and discovering there are multiple ways to approach problem solving. They also like to work together in teams and be involved in cooperative learning."** •

THE DAYS SUMMER SCIENCE CAMP IN COLORADO

Thanks to National Science Foundation funds, Denver Area Youth Services (DAYS), Regis University's "Hands-On Science Institute", the Children's Museum of Denver, and the Fellowship Camp at Black Hawk, Colorado work together, offering an exciting four-week commuter and residential Summer Science Camp for 50 under represented 6th and 7th grade students living in southwest Denver in the summer of 1996.

The "DAYS Summer Science Camp" curriculum is broken down into the following components: During the first week, participants attend Regis University campus for the "Hands-on Science Institute", a program which has won acclaim of participants, parents, and teachers in its four-year existence at Regis University. During this first week, the students are engaged in five different science modules: 1) "All About Air" introduces key sciences concepts, such as volume, air pressure, gas and energy, and the composition of air, and sciences applications, taught by Regis University **staff**; 2) "Thinking About Energy" provides participants with information on energy sources and usage, the future of energy, and energy waste; 3) "Mystery Science" illustrates the components of the scientific method by exposing students to a variety of experiments, including research concepts like molecules, inertia, and surface tension; 4) "Soda Bottle Science" allows the participants to make their own Cartesian Divers, and to investigate science concepts like properties of air, volume, mass, and air pressure; 5) the "Polymers" unit reflects practical uses of chemistry.

Week two and three of the Summer Science Camp program are coordinated to be spent at the Denver Children's Museum. Participants are split into two groups; one group attends the museum in the morning, the other in the afternoon. Each group is involved in Children's Museum activities for three hours per day and participates in different modules: Chemistry Class, Discovery Science Lab, and computer classes. The overall theme of the learning activities at the Children's Museum is "Environmental Protection". Exciting **field trips** to the National Weather Service, the Denver Zoo, the Colorado School of Mines, and the Coors Brewery complement this program phase.

"...All three agencies are very enthusiastic about being chosen by the National Science Foundation to host a Summer Science Camp, and appreciate the added support and acknowledgement that goes along with being a National Science Foundation grant recipient."

BEST COPY AVAILABLE

THE DAYS SUMMER SCIENCE CAMP IN COLORADO

The Denver Area Youth Services (DAYS) offers a four-week Summer Science Camp to 50 under represented students entering 7th or 8th grade. The camp represents a unique collaboration of a community-based agency with institutions of science education – Regis University, the Children's Museum of Denver and the Fellowship Camp at Blackhawk.

During the final week of the Summer Science Camp program, participants are lodged at the Fellowship Camp in Blackhawk. This exciting outdoor science experience focuses on activities that allow students to apply their previously acquired knowledge on "Environmental Protection", while researching, designing, and conducting their own experiments. Team and self-esteem building skills development are incorporated in this program phase.

Participants are engaged in a variety of **academic year follow-up activities**, such as "Saturday Science Academies" and bi-monthly meetings with all DAYS program attendants. Once the former Summer Science Camp participants reach age 14, they are encouraged to return to the Denver Area Youth Services programs for summer jobs.

Program Director Dr. Jim Giulianelli underlines the great collaborative effort of the institutions hosting this Summer Science Camp. He says: **"...All three agencies are very enthusiastic about being chosen by the National Science Foundation to host a Summer Science Camp, and appreciate the added support and acknowledgement that goes along with being a National Science Foundation grant recipient."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
American Indian Science & Engineering Society, Boulder, Colorado	42	3 weeks	8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Denver Area Youth Services, Denver, Colorado	50	4 weeks	6, 7	1, 2, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SCHOONER, INC./SPACES SUMMER SCIENCE CAMP IN CONNECTICUT

Sailing aboard a traditional schooner is only one unique aspect of the 1996 **"Schooner, Inc./SPACES Summer Science Camp"**. The **National Science Foundation**, Schooner, Inc. and the SPACES initiative have joined funds and forces to set up a six week summer program, housed at the Helene W. Grant Elementary School, for 50 New Haven inner-city under represented students selected from 7th through 9th grade.

The program's **goals** are to increase the competitiveness of under represented students in the science and math fields, to prepare them for possible careers in these fields, and to foster positive youth development.

The Summer Science Camp program splits the 50 students into two groups of 25. One group attends a ten-day aquatic science program, which introduces them to use canoes as an alternative means of exploring freshwater and tidal marsh ecosystems. The other 25 students enroll in an enriching sciences and mathematics **curriculum**. Three major areas are covered in the sciences: Biology, Physical and Earth Sciences, stressing scientific skills such as observation, measurement, classification, and interpretation of data. Mathematics is integrated into the science curriculum as much as possible. A strong emphasis is placed on accurate data reporting: Participants receive a lab notebook to be used for the entirety of the program. The notebook contains data collection for each site visited; after the program, the students' data is forwarded to the University of New Haven to be entered in their GIS model of the Quinnipiac River.

A **staff** of public school teachers, Schooner employees, high school and college students, the New Haven Parks Department, and the University of Connecticut Cooperative Extension combine their efforts in this venture.

"Participants...explore seven different sites along the river and New Haven harbor. At each site they...study different aspects of aquatic ecology in order to construct an overall picture of the Quinnipiac River and its watershed."

"...During the program, participants ...gain an understanding of the Quinnipiac River through hands-on explorations of the river at various sites as it flows through Connecticut to Long Island Sound. Participants ...explore seven different sites along the river and New Haven Harbor. At each site they ...study different aspects of aquatic ecology in order to construct an overall picture of the Quinnipiac River and its watershed," explains *Program Director Carol Kasper.*

Minimal time is spent in the classrooms of Helene W. Grant Elementary School, the program site. An additional **field trip** to Lighthouse Point, West Haven, gives students the opportunity to sail aboard the schooner Quinnipiac!

Parents are involved throughout the whole Summer Science Camp program, starting with the orientation activities and ending with the closing celebration.

During the academic year, **follow-up activities** focus on tracking participants' success in school, and further academic guidance and support. Summer Science Camp graduates are invited to participate in the regular SPACES school year program. •

Schooner, Inc.

CONNECTICUT PRE-ENGINEERING PROGRAM MATH AND SCIENCES SUMMER PROGRAM (CPEP)

The science curriculum is the driving force behind the mathematics, language arts, and guidance components of the summer science program, working to integrate the disciplines.

The **National Science Foundation**, the Department of Energy, and the Hartford Foundation for Public Giving awarded **Trinity College's Connecticut Pre-Engineering Program (CPEP)** funds to conduct the five-week **"CPEP Math and Sciences Summer Program"** from 1993 to 1995, and again in 1996. In the 1995 Summer Science Camp, 57 promising 8th and 9th grade under represented students took their first boat ride in Groton to conduct "Project Oceanology", and established a floating classroom on Long Island Sound. Students are separated into small groups and given a first hand look at oceanography. Summer Science Camp participants put down nets and drag the waters for sea life. Lobsters, crabs, skates, and a variety of sea anemones fill the net; students are then encouraged to pick up and examine these creatures. They investigate migrating patterns, reproductive cycles, and study the differences between New England and tropical waters. Participants interview the captain concerning navigational techniques and nautical equipment, while others test the waters at varying depths to determine temperature variations. In accordance with the **curricular** focus on water, students also visit the Norwalk Maritime Center, and the Science Center of Connecticut.

The "CPEP" Summer Science Camp actively involves Hartford middle school students in science inquiry and math during its five-week course. The program integrates instruction in science and math, computer usage, guidance and career counseling, language and study skills, along with **field trips** that emphasize the project's hands-on approach.

Program Director Beverly Hunter Daniel further described the program's activities and participants' learning experiences: **"...Participants worked with hands-on projects in a non-traditional setting. They dissected sharks, experimented with fast plants, created a newsletter, assisted with videotaping, learned math using jellybeans, listened to guest speakers and engaged in role-playing activities. Some experienced for the first time the use of graphic calculators. Others expanded their knowledge of computers."**

BEST COPY AVAILABLE

cpep

Participants estimate the height of Trinity chapel on the campus of Trinity College during the Physics Olympics competition.

"CPEP" Summer Science Camp participants' learning experiences continue in the fall with three **follow-up sessions** on Saturdays. Students engage in comprehensive learning experiences during laboratory and classroom workshops on consumer chemistry. The field trip for teachers, parent chaperones and students to the Boston Science Museum is the program highlight of these Saturday sessions.

The program's newsletter gives voice to its success. *Participant Isabel Vasquez* writes that **"...the program is helping me to get prepared for school in the fall."** *Edwin Acosta* thinks that **"...CPEP Summer Science Camp is a good place to learn about science and math. The teachers are fun, and the tutors are the best."** •

The top-notch **staff** largely contributes to the program's success and consists of college faculty and middle school teachers.

The Southern New England Chapter of the National Society of Black Engineers sponsors and organizes a math and sciences career fair as part of the program, during which participants have the opportunity for discussion with African-American, Hispanic and female engineers from the Hartford area.

"Participants...dissected sharks, experimented with fast plants, created a newsletter, assisted with videotaping, learned math using jellybeans, listened to guest speakers and engaged in role-playing activities."

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Schooner Inc., New Haven, Connecticut	50	6 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Connecticut Pre-Engineering Program, Inc., West Hartford, Connecticut	57	5 weeks	8, 9	1, 2, 3, 4, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

SUMMER SCIENCE CAMP AT DELAWARE STATE UNIVERSITY

Delaware State University President Dr. William B. DeLauder states: **"...This is the first award Delaware State University has received from the National Science Foundation for the Summer Science Camp...Delaware State University is...providing the facilities for instruction and science projects...The institution will continue to provide all of the support...to make this program a success."**

"Much gratitude is due to the National Science Foundation, Division of Human Resource Development, for allowing us to make a difference in the lives of the seventh and eight grade students who are participating in the Summer Science Camp."

Forty under represented 7th and 8th grade students participating in the 1996 **Summer Science Camp at Delaware State University**, funded by the **National Science Foundation**, are to be fully engaged in a host of hands-on activities, including science projects that are expected to be judged in local and state math and sciences competitions. Students are recruited from the target school districts of Kent and Sussex counties.

This Summer Science Camp program seeks to increase participants' knowledge in science and math, to instill positive attitudes towards these disciplines via exciting science projects, mentoring, academic and career counseling services - provided by an excellent **staff** and local scientists - , individual tutoring, role model exposure, and career exploration opportunities.

The Summer Science Camp **curriculum** integrates the disciplines of Logic, Algebra, English, and Life and Physical Sciences. Educational **field trips** to Bombay Hook Wildlife Refuge in Delaware and the Maryland Science Center enhance the other academic program activities.

Parents are encouraged to be involved in program activities, and their children's education in general.

Participants have just entered the life science laboratory and are ready to work!

Students and teachers of the "Summer Science Camp at Delaware State University" outside the university's Science Center.

Students have the opportunity to attend a variety of **follow-up activities during the academic year**, and to later in enroll in Delaware State University's other precollege programs like the "Saturday Academy" and the "Intensive Summer Science Precollege Program". *The Program Director, Dr. Gustav Ofosu*, is very grateful and excited to have obtained funding from the National Science Foundation for his unique Summer Science Camp and states: **"...We are proud that the Delaware State University Summer Science Camp Program provides opportunities for students to make new friends, to receive enhanced academic challenges, increase their career awareness for science and mathematics areas, provide counseling and tutorial services, field trips, interactive sessions with scientists ...to make a difference in the lives of the 7th and 8th grade students participating in the Summer Science Camp."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Delaware State University, Dover, Delaware	40	5 weeks	7, 8	1, 2, 3, 4, 5, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

UNIVERSITY OF THE DISTRICT OF COLUMBIA'S SUMMER SCIENCE CAMP IN WASHINGTON, D.C.

A letter from one participant's mother reads, "You will be delighted to know that he has already successfully utilized the knowledge he gained in the program by recently placing First in a Science Fair Competition."

In 1992 the **University of the District of Columbia** joined forces with the **National Science Foundation** to expand the existing College of Professional Studies/Science and Engineering Center's precollege program by funding and conducting a four-week commuter **Summer Science Camp** for 60 under represented 7th and 8th grade academically talented students from the metropolitan area of the District of Columbia. *The Dean of the College of Professional Studies, Dr. Philip L. Brach,* explains: **"...The Summer Science Camp has been an excellent addition to the Pre-College Programs ...This addition has allowed us to better prepare area youth for careers in science and related technologies."**

Program activities provide a non-traditional learning environment that promotes knowledge acquisition through hands-on mathematics, computer science, and electrical engineering instruction. The mathematics module teaches and stresses creativity and applications of concepts in the topics of Number Theory, Group Theory, Finite Structures, and Analysis. The electrical engineering module provides content on: basic circuitry, basic definitions and theories of electricity, and practical experiments with measures of voltage, construction of power sources, wiring, the use of bread boards, and reading schematic diagrams. In the computer science module students are taught the use of the computer language BASIC, and operate individual computers in problem solving activities.

Summer Science Camp computer science teacher Tsitsi Nyika relates one example of successfully increasing a student's skills in computer science: **"...Last summer, I had a student who confessed to me that her worst subject in school was computers. However, after being a participant in the Summer Science Camp she discovered that it wasn't a difficult subject after all. She enjoyed the computer class tremendously, and surprisingly she was even the the top student in my class. This may be only one example, however if the Summer Science Camp were to be discontinued, I am afraid that there will be no Summer Science Camp to reach out to another child ..."**

Field trips to the National Institute of Health, the Rockcreek Nature Center,

A young student working on a science project in the university's engineering laboratory.

and the Franklin Institute, along with invited guest speakers, provide program participants with opportunities to experience the use and applications of mathematics, engineering, and computer science in the working world.

Academic year follow-up is coordinated with the Physical Science Institute at the University of the District of Columbia. Here, the Summer Science Camp participants' enthusiasm for science is further extended by inviting them to enroll in a science enrichment program serving 9th through 12th grade students.

The Summer Science Camp's positive outcome is reflected in the following letter from *participant Mark A. James' mother*: **"...My sincere thanks and appreciation to you, the staff and teachers of the University of the District of Columbia for conducting effective Summer Science Camps.... After he attended the program last summer, he said: 'Mom, I can't wait to go back next summer.' The classroom activities and field trips have been educational and rewarding to Mark. He feels further motivated in his interest and ultimate goal of pursuing a scientific career. You will be delighted to know that he has already successfully utilized the knowledge he gained in the program to recently place First in a Science Fair competition."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
University of the District of Columbia, Washington, District of Columbia	60	4 weeks	7, 8	1, 2, 4, 6, 7, 8, 9

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SUMMER SCIENCE AND MATHEMATICS CAMP IN FLORIDA

Santa Fe Community College in rural Gainesville, Florida, received funding from the **National Science Foundation** to offer an intensive four-week **Summer Science and Mathematics Camp (SSMC)** in 1996 for 60 under represented 7th grade students selected from the Alachua County School District.

The program's **goal** is to provide academic enrichment and career exploration experiences for its participants to remain in school, acquire a strong pre-college education and pursue an undergraduate education in science, mathematics and engineering.

The program uses the **"Teaching Integrated Mathematics and Science" (TIMS) curriculum**, which uses concepts central to sciences to teach concepts which are fundamental to mathematics. Students are actively involved in experiments using the concepts of a variable and a function as central foci of the their learning experiences. The experiments are designed to facilitate an understanding of the relationship between independent and dependent variables, graphs, proportional reasoning, non-linear relationship, measures of central tendency, and probability. Students are required to exercise their writing skills by documenting each experiment in form of a written report. Instructional strategies employed in the Summer Science Camp are: discovery, hands-on and cooperative learning. Participants work in teams of two for about four hours on each experiment.

The program uses the "Teaching Integrated Mathematics and Science" (TIMS) curriculum, which uses concepts central to science to teach concepts which are fundamental to mathematics.

BEST COPY AVAILABLE

Resource speakers meet with the students once a week to relate their experiences and to stress the importance of their work, in order to motivate the participants. Their presentations seek to encourage discussions of ethical and philosophical issues related to scientific research.

Field trips are scheduled to include a physics show, a tour of the physics lab at the University of Florida, a visit to the Science and History Museum, and to the Bat Research Center. Personnel at these sites provides the participants with information on mathematics and science-related careers, work experience, and educational requirements.

Additionally, they receive guidance to develop their four-year individual high school career plans. The educational paths to accomplish these goals are discussed and supported by "Discover for Junior High and Middle Schools", a computer-based program.

The Summer Science Camp program offers **academic year follow-up activities.** •

MACINTOSH USING SCIENCE TEAM IN FLORIDA

"**Macintosh Using Science Team**" (**MUST**) participants at the **Miami Museum of Science** work in cooperative research teams, conduct environmental research, and utilize state-of-the-art technology in a four-week commuter Summer Science Camp with a disciplinary focus on marine and computer science. A **National Science Foundation** grant has made it all possible since 1993, with additional support from the DeWitt Wallace-Reader's Digest Fund.

The program targets 48 under represented 8th grade middle school students from Dade County in Florida with the objective to attract and maintain their interest in the sciences. Participants are provided with the ability to use technological tools to enhance their written and verbal skills, in order to effectively communicate the results of their work to others. The Summer Science Camp seeks to help students recognize the usefulness of applying mathematical concepts, technology, and the scientific method to the study of problems affecting the Biscayne Bay marine environment and neighboring shorelines.

Students are provided with the opportunity to actively participate in research teams and realize that cooperation and teamwork are essential in scientific research. They form four teams of six "researchers" for two four-week long sessions. Participants are split up into research teams, guided by mentors, for each of the two twenty-day sessions; these teams alternate using the Macintosh computer lab and going out in the field to observe and collect data related to the topic, "The Impact of Human Activities on South Florida's Marine Environment."

During the field research activities students are introduced to the techniques of surveying, sampling, and experimental design. They systematically collect data on common environmental variables like salinity, temperature, depth, meteorological conditions, water transparency, and perform taxonomic identifications of marine and coastal organisms using reference manuals. They then process and analyze the data using computer technology to create spreadsheets, statistical analysis, graphs and charts.

The "Macintosh Using Science Team" Summer Science Camp is conducted by *Project Director Alberto Ramirez* and four marine science graduate students from the University of Miami and Florida International University. Four former Summer Science Camp participants assist this **staff** and serve as excellent role models for the new Summer Science Camp participants.

The Summer Science Camp takes participants on several **field trips** to local marine environments. Two special field trips to the coral reef environments of Biscayne National Monument

"...Our program is unique because of the multi-disciplinary approach, the diversity of the participants, the infusion of advanced computer technology...and the opportunities open to the participants after completion of the summer program."

Miami Museum of Science & Space Transit Planetarium

BEST COPY AVAILABLE

Participants prepare transect lines and buoys to set up a sampling site at Bear Cut in Key Biscayne, Florida.

and Pennnekamp State Park are conducted; here students are able to apply the water knowledge and skills developed and practiced during the previous Summer Science Camp program weeks.

At the end of the program, the MUST teams present the results of their investigations to their peers and guests during a Family Night. Diplomas and awards are given to participants. **Parental involvement** is high.

"Computer Lab," "Junior Explorers," "Saturday Science Club," and "Field Expeditions" are exciting follow-up activities to keep the middle school participants involved with the Miami Museum of Science.

Program Director Alberto Ramirez states: **"...Our program is unique because of the multi-disciplinary approach, the diversity of the participants, the infusion of advanced computer technology, the exposure of participants to the marine environment, the related activities within an informal education setting, and the opportunities open to the participants after completion of the summer program".**

During the academic year follow-up "Computer Lab", "Junior Explorers", "Saturday Science Club", and "Field Expeditions" activities keep participants involved with the Miami Museum of Science.

The post-program evaluation showed excellent student outcomes: For the 1995 participants in the "MUST Summer Science Camp" *participant Maria Lacayo* won the **National Science Teacher Association** Award in the Pre-College Program category. She was one of 67 precollege presenters at the National Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C. •

TECHNOLOGY ENHANCED ACHIEVEMENT IN MATHEMATICS AND SCIENCE (TEAMS) IN FLORIDA

Florida International University, the Dade County Public Schools, and the **National Science Foundation** funded the 1996 Summer Science Camp to serve 68 under represented students selected from 7th through 9th grade in the Dade School District. **"Technology Enhanced Achievement in Mathematics and Science" (TEAMS) Summer Science Camp is a major expansion of the current "Partnership of Academic Communities" (PAC) program**, providing enrichment opportunities for students in mathematics, science, and technology.

The **goals** of "TEAMS" are: to enrich under represented, at-risk students' experiences in mathematics, sciences, and technology, while improving their attitudes toward sciences; to provide them with scientific ways of thinking and reasoning, systematic learning/study skills sufficient for a success-oriented education, and self-concept enhancement.

The program site for both projects is Florida International University, which provides campus facilities, faculty, and graduate and undergraduate student support. Resources from the Dade School District are used as well.

The "TEAMS" Summer Science Camp offers morning and afternoon enrichment, research, and laboratory experiences. A **staff** of "Dade County Public Schools' Urban Systemic Initiative" leader teachers in mathematics, science, and technology, Florida International University faculty in computer science and science education, along with graduate students, provides workshops, field activities, and seminars for the participants. Professionals from the community are invited as guest speakers during the "TEAMS" Summer Science Camp.

TEAMS students study space technology during an educational field trip.

> The primary characteristic of the "TEAMS" curriculum is its hands-on and minds-on approach.

The primary characteristic of the "TEAMS" **curriculum** is its hands-on and minds-on approach. The mathematics and sciences curricula follow the NCTM and NSTA standards, aimed at fostering mathematical and scientific thinking.

The five-week, four days per week summer science experience is supplemented by **academic year Saturday sessions**, featuring presentations by mathematicians and engineers from nearby organizations like IBM and the Bell South Company. All activities have the goal to build sufficient confidence among participants to choose science and mathematics majors in college, in order to be prepared for future careers in these fields. •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Santa Fe Community College, Gainesville, Florida	60	4 weeks	7	1, 2, 3, 4, 7, 9
Miami Museum of Science, Inc. Miami, Florida	48	4 weeks	8	1, 2, 3, 4, 6, 7, 8, 9, 10
Florida International University Miami, Florida	68	5 weeks	7, 8, 9	1, 2, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

ATLANTA SUMMER SCIENCE CAMP IN GEORGIA

The **"Atlanta Summer Science Camp"** was made possible by a grant from the **National Science Foundation** to serve 60 under represented students selected from 7th, 8th and 9th grade in Atlanta public schools. The "Atlanta Summer Science Camp" is designed to introduce these students to an enriching program of math and science activities, career exploration, and reflection.

The four-week commuter Summer Science Camp is infused at two sites into the "Camp Best Friends", an award-winning summer camp run by the City of Atlanta. Summer Science Camp participants spend their mornings and early afternoons in science activities, and then join the "Camp Best Friends" participants for the remainder of the afternoon program.

Participants on a field assignment for "Project Water Watch."

The "Atlanta Summer Science Camp" **curriculum** mainly focuses on environmental science, with four sub-themes: 1) "The Wild Side", 2) "Energized", 3) "The Real Thing", and 4) "Project Water Watch".

"The Wild Side" module centers its activities around the Zoo Atlanta. Here, students engage in investigations involving the observation of zoo animal behavior, with an emphasis on the relationship between the environment, animal behavior, and species survival.

The "Energized" module exposes students to careers in applied mathematics, physics, and engineering. Students engage in problem solving projects as they construct model insulated structures to house and retain heat. The "Atlanta Summer Science Camp" participants travel to the educational facility "Shenandoah", operated by Georgia Power to observe the generation and conservation of power.

Participants in "The Real Thing" module meet with guest speakers from the fields of sciences and math. Visits to Georgia State University and the Georgia Institute of Technology introduce the students for two consecutive days to lab facilities, where they carry out mini-projects.

"Project Water Watch" engages students in a field study related to the areas of Biology, Fresh Water Ecology, Chemistry, and Environmental Science. An overnight experience at Unicoi State Park allows attendants to investigate the ecology of the north Georgia mountains. Participants also travel to the Chattahoochee River to collect water samples for comparison.

ing strategies with the participants.

Most Summer Science Camp participants made very positive comments about the program, especially their visits to the universities: **"...Today at Georgia State I met Dr. Patterson. He took us to meet his coworkers. I learned about how to operate a computer, the different jobs people do at Georgia State, how the computers work, and what data they occupy. I would like to know what kind education it takes for that field of work."**

Program Director Dr. Keyes summarizes the most beneficial components of her Summer Science Camp program: **"...a) hands-on physical science activities; b) cooperative group work; c) visits to scientists, engineers, and mathematicians at the universities; d) projects with college mentors; e) research activities; f) outdoor experiences; g) overnight experiences; and h) creative art and writing experiences."** •

"...The human and physical resources in our surroundings have enabled us to express our project themes of: science and mathematics as a team effort; science and mathematics as a human endeavor; and science and mathematics as authentic inquiry."

Three major components guide the design of the "Atlanta Summer Science Camp": 1) collaborative social interaction in science, engineering, and mathematics; 2) relationships among science, math, and engineering and the quality of human life; 3) student inquiry.

Program Director Dr. Carolyn Keys explains: **"...The human and physical resources in our surroundings have enabled us to express our project themes of: science and mathematics as a team effort; science and mathematics as a human endeavor; and science and mathematics as authentic inquiry."**

The **staff** of college faculty, middle school teachers, and college students who act as mentors and counselors, receives comprehensive training in utilizing cooperative learning and team build-

Georgia State University

BEST COPY AVAILABLE

CLARK ATLANTA UNIVERSITY SUMMER SCIENCE CAMP IN GEORGIA

Weekly discussions on the ethics and philosophy of science are incorporated into the curriculum of the **National Science Foundation** funded **"Clark Atlanta University Summer Science Camp"** for 40 under represented 7th and 8th grade students selected from schools in metropolitan Atlanta.

This commuter program has provided four weeks of intensive academic enhancement and instruction using an interdisciplinary approach directed towards the knowledge of the sciences, scientific methodology, mathematics, communication skills, and computer applications from 1993 to 1995, and again in 1996.

The weekly discussions on the ethics and philosophy of sciences present opportunities for the participants to engage in debates on topics related to ethical issues such as: truth and honesty in scientific research, the impact of biotechnological advances, organ transplantation, and euthanasia. These discussions on the philosophy and ethics of science are integrated in the on-going classes and activities.

Participants are divided into two groups for classes Monday through Thursday, and the classes are further divided into teams. A special motivational math and science strategy in this distinctive Summer Science Camp is that each team is given the name of a scientist, engineer, or mathematician from different ethnic groups, and the participants are required to write a biographical sketch of their team's scientist, allowing them to produce 'written' role models and to gain knowledge of these scientists and their work.

Weekly career seminars with scientists, engineers, mathematicians, and precollege math and science teachers offer participants the opportunity to examine careers in the sciences, technology, and math and science education through discussions with these role models. To enrich these career seminars, **field trips** on Fridays round out the program's academic experiences.

Follow-up activities during the academic year include academic and math and science career workshops for participants and parents. In general, **parent participation** in the program is high, during the academic year it averaged 75% between 1993 and 1995. To assist parents and students in their high school course selection for college math and science careers, the "Clark Atlanta Summer Science Camp" program offers a "Science, Engineering, and Math-Credit Card" to all participants and their parents. This card lists all the science and math classes to be taken by the students, and has to be consulted when they register for classes, and when parents check their schedule for approval. *Parent Mary Tobins Hicks* says that her daughter **"...benefited greatly from the qualitative instructional ...and enrichment activities provided. I also wish to commend ...the staff on the very fine curricula offerings and quality personnel selected for this effort."**

Program Director Dr. Melvin R. Webb concludes: **"...The program's retention rate from 1993 to 1995 was 100%, and attendance was greater than 95%. Follow-up information ...reveals that 55% of participants made the honor roll, 90% made A's or B's in sciences, 85% made A's or B's in mathematics, and all participants have enrolled in advanced level mathematics and science courses."** •

Fifty-five percent of the participants made the Honor Roll during the school year after the Summer Science Camp.

Students and parents attend the closing ceremony to witness presentations of the successful and proud participants.

BEST COPY AVAILABLE

SCIENCE, ENGINEERING AND MATHEMATICS LEADERS IN GEORGIA

In order to create **" Science, Engineering, and Mathematics - Leaders", Kennesaw State College** holds a four-week college and community operated, commuter Summer Science Camp funded by the **National Science Foundation** in 1993 to serve 57 under represented 7th through 9th grade students from suburban Atlanta.

"...The program's goal is to help students develop the leadership skills needed to take an active role in their academic and career success in sciences, engineering, and math as well as to assist their peers in achieving academic and career success in these fields," states *Program Director Dr. Army Lester.*

By providing participants with innovative and exciting learning experiences in sciences, math and engineering, the Summer Science Camp program has been able to break the negative stigma these disciplines sometimes carry. Students participate in highly interactive hands-on classroom and laboratory activities.

Each student is required to take on an active role in a group science research project to develop a strong sense of teamwork in learning and become a "Science, Engineering, Mathematics -Leader" (SEM Leader). One of the most interesting Summer Science Camp activities is the use of multimedia technology by the participants in the production of videos about their Summer Science Camp experiences. The "SEM Leaders" take these videos back to their respective home schools and use them to excite their classmates about science and math.

Participants are exposed to **career opportunities** from a variety of science, engineering, and math professions and even embark on **field trips** to visit professionals of the respective sciences fields at their worksites.

The **staff** consists of college faculty and students, public school teachers, professional scientists as guest speakers, community members, and **parents** as volunteers.

A graduation evening ceremony ends this successful Summer Science Camp. Here, the student videos are presented to peers, families and staff, special awards are given to students for outstanding participation and performance, and all participants receive an official diploma

The success of the Summer Science Camp is highlighted by a 100% student retention rate and the large number of "SEM Leaders" who have won awards in science fair competitions. Responses from SEM Leader's support teachers and parents acknowledge the benefits of the program.

Principal Investigator Dr. Army Lester and a science instructor observe the "Science, Engineering, and Mathematics Leaders" at work in the science laboratory.

BEST COPY AVAILABLE

Young "Science, Engineering and Mathematics Leaders" at work on their science projects in the laboratory.

SCIENCE, ENGINEERING AND MATHEMATICS LEADERS IN GEORGIA

designating them as having achieved the status of a "SEM Leader".

During the academic year follow-up activities, participants' newly acquired sciences and math knowledge continues to be fostered in mentorship and tutoring sessions. In class at their home schools, participants themselves have the opportunity to practice their leadership skills by leading their peers in lectures, lab activities, and discussions.

"...The success of the Summer Science Camp is highlighted by a 100% student retention rate and the large number of "SEM Leaders" who have won awards in science fair competitions. Responses from SEM Leader's support teachers at their home schools and parents acknowledge the benefits of the program," concludes *Program Director Dr. Army Lester.*

"1995 - 1996 SEM Leader of the Year", participant Deanna Boyd, states that **"...the Summer Science Camp experience was one of the best things in my life! ...Presenting my research at the National Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C., ...winning first place in a local science fair, and being nominated 'Science, Engineering, and Math Leader of the Year' have helped to build my confidence and interest in a science, engineering, and math career."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Georgia State University, Atlanta, Georgia	60	4 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9
Clark Atlanta University, Atlanta, Georgia	40	4 weeks	7, 8	1, 2, 3, 4, 5, 7, 8, 9, 10
Kennesaw State College, Marietta, Georgia	57	4 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

PRE-FRESHMAN ENRICHMENT PROJECT (PREP) SUMMER SCIENCE CAMP IN ILLINOIS

The **National Science Foundation** has awarded **Loyola University** and **Aspira of Illinois** funds for a **bilingual (Spanish/English)** six-week commuter **"Pre-Freshman Enrichment Project (PREP) Summer Science Camp"** serving 27 high-ability yet low-opportunity Hispanic 7th through 9th grade students.

The Summer Science Camp program is modeled after the National Science Foundation and Loyola University funded "Young Scholars" Program, a math and computer science summer enrichment program for high school students. The "PREP Summer Science Camp" has provided its middle school participants from 1993 to 1995, and again in 1996, with hands-on experiences in computer science and its related disciplines.

The curricular focus is solely on computer science. Using an interdisciplinary approach to introduce computer science to students from both hardware and software perspectives, students first learn how to assemble IBM-compatible microcomputers and then perform digital circuitry experiments on the computers and other electronics equipment; second, experiment with computer concepts through programs they write in the Summer Science Camp software science course; and third, experiment with small computer-controlled machines, building them from the component level on up, and writing the controlling programs themselves. The Summer Science Camp's instructional activities are built around Computer Science Lecture/Discussion, Computer Science Laboratory, Hardware Design/Circuitry Lecture and Hardware/Circuitry Lab, and Lego/Pascal. Participants go on four **field trips**: Argonne National Laboratory, a scientific research environment with demonstrations in both superconductivity and computers, Northwestern University, People's Gas, and a stock market trading firm to gain real images of advanced computer science applied to the business world.

PREP is bilingual with instruction, handouts, tutoring, and field trips communicated in both Spanish and English.

Program Director Dr. Dale F. Reed says about the scheduled educational field trips: **"...The participants will see a number of available options leading to several different types of stimulating and productive careers."**

On the last day of the Summer Science Camp program, students prepare their presentations on the work they have completed over the course of the summer for the "Open House"event, which allows **parents**, community leaders, and the media to view the results of a successful Summer Science Camp.

A 13-week **follow-up** program during the academic year continues the classroom work, focusing especially on computer science, and academic counseling.

During these thirteen 2.5 hour after school classes, students continue the Pascal programming component of the summer program. Participants are awarded credit by the Board of Education, which they may apply as an elective towards high school graduation. Parents are strongly encouraged to follow their child's progress.

"...Loyola/Aspira Summer Science Camp does not attempt to duplicate any typical course in any elementary or secondary curriculum. It is, frankly, an enrichment experience that so cuts across disciplinary boundaries and so involves academic, business, and community ...it is not realistic to expect schools to offer the same type of opportunity...," states *Program Director Dr. Dale F. Reed.*

A notable feature of this Summer Science Camp program is the fact that it is bilingual with instruction, handouts, tutoring, and field trips communicated in both Spanish and English. However, there is continuous encouragement to achieve fluency and competency in English to prepare participants for enrollment in a mainstream university. •

MIDDLE SCHOOL MATH/SCIENCE PROGRAM FOR YOUNG TEENS IN ILLINOIS

Six National High School Institute counselors assist the 16 program instructors and 6 graduate and high school student assistants. The program staff continuously keeps parents informed about **their children's success and performance in the Summer Science Camp.**

The National High School Institute at Northwestern University in Illinois received funding from **the National Science Foundation** to conduct a four-week commuter Summer Science Camp, the **"Middle School Math/Science Program for Young Teens"**, serving 44 gifted under represented students in 1995, selected from 6th, 7th, and 8th grade in nine Chicago Public Middle Schools by the Gifted Program Directors. The 1996 summer program serves approximately 70 students. The Summer Science Camp's experiences in the 1995 commuter program led to a change from commuter to residential program in the summer of 1996 at Northwestern University.

The "Middle School Math/Science Program for Young Teens" **curriculum** rotates all students through eight academic and one recreational class. The eight academic courses are modeled after the National High School Institute's "Engineering and Science Program for High School Students" and include: Environmental Studies; Weather Studies; Astronomy and Space Science; Speech, Linguistics and Mathematics in Engineering; Introduction to Computer Architecture and Programming; Mathematics and Music; Computers, Internet, Spreadsheets, and Word Processing; and Exploring the Science of Concrete. The "Environmental Studies" course focuses on three elements of environmental science: freshwater studies, forest studies, and meteorology. A **field trip** to the Chicago River in the Forest Preserves complements the academic activities. Students investigate the river's history, pollution, and the interconnection of plants, water, and other environmental elements. The "Weather Studies" class centers on weather as an environmental science in short sessions and hands-on activities. The "Astronomy and Space Science" module allows students to study the moon, planets and galaxies, the use of telescopes, space probes, life on the space shuttle, and the future of space science. The "Speech, Linguistics and Math in Engineering" class explores the interconnections of these fields and their relevance in Engineering. Participants study aspects of speech technology, have access to Alexander Graham Bell's archives and cutting edge AT&T technology like caller identification systems to learn about the physiology of their

Due to the heat wave in Chicago and the long bus rides, for some students four hours a day, students were having difficulty focusing on a single research project. To counter the restlessness, the single research project was replaced with more hands-on activities, and the commuter program was changed to a residential one. This was, perhaps, the single most significant lesson learned by the faculty.

voices and how characterize the sounds of speech. The "Introduction to Computer Architecture and Programming" class provides students with a general overview of computer architecture in terms of hard- and software, including examples of computer logic and programming techniques. An "Introduction to Music" class is designed to give participants a general understanding of the components of music, its historical background and relationship to mathematics. The "Computers, Internet, Spreadsheets, and Word Processing" module allows attendants to explore the functions and inside of a computer, its operating systems, the World Wide Web, and the use of acquired information in spreadsheets and graphics. "Exploring the Science of Concrete" is a unique course, which utilizes discussions and hands-on laboratory sessions as instructional methods. Topics include: what is concrete; how it is made; its chemical consistency and physical characteristics; where, how and why we use concrete.

Six National High School Institute counselors assist the 16 program instructors and 6 graduate and high school student assistants. The program **staff** continuously keeps **parents** informed about their children's success and performance in the Summer Science Camp.

The **academic year follow-up component** at the respective home schools allows the participants to continue with the work on their hands-on science projects under the supervision and mentorship of their home school science teachers. •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Loyola University at Chicago, Chicago, Illinois	27	6 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Northwestern University, Evanston, Illinois	44 - 70	5 weeks	7, 8, 9	1, 2, 4, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

PURDUE-CALUMET ENGINEERING AND SCIENCE SUMMER PROGRAM IN INDIANA

Among the program's many success stories, one student graduated from high school as valedictorian of her class of 160 students, and received a $20,000 scholarship from U.S. Steel to attend Indiana University at Bloomington as a Biochemistry and Pre-Med major.

Funding from the **National Science Foundation**, the **"Purdue Calumet Engineering and Science Summer Program"** has allowed 50 under represented 7th through 9th grade students from the Gary, East Chicago, Hammond, and neighboring northwest Indiana and Illinois communities to attend a five-week summer experience of college preparation at **Purdue Calumet University** from 1993 to 1995, and again in 1996. These students are targeted to ensure they take the math and science courses in high school required to enter science, engineering, and math programs in college, and to ultimately pursue careers in these fields.

"...The program provides a foundation of discipline, and pushes students to use their academic skills at an age when guidance and exposure to real-life experience is important. The goal is to demonstrate to students that engineering and science are exciting, rewarding, and lucrative careers...," says *Program Director Dr. Edward S. Pierson.*

The engineering and sciences summer program curriculum focuses on: microbiology, chemistry, computer graphics and drafting, electronics, and mathematics. Computer students are introduced to the Internet; and all students participate in weekly sessions on acquiring a positive mental attitude.

The Summer Science Camp's program begins with an introductory course to a science topic, then provides participants with the necessary math tools, and finally enrolls the students in hands-on science and computer lab sessions to reinforce and apply the previously learned concepts. Additionally, tours allow participants to view engineers and scientists at the workplace. Participants take on their own math and sciences research and model building

At the program's closing ceremony, students have a chance to share their career exploration project results with the staff, peers, and their families.

A student participant working on a motor in the engineering laboratory at Purdue-Calumet's Engineering Department.

projects with the goal of entering them in a science olympiad.

Each day, the mornings are reserved for instructional activities like lectures, discussions, and demonstrations. During the afternoons, the students are involved in hands-on laboratory and computer sessions, or industrial tours.

The "Purdue-Calumet Engineering and Science Summer Program" **staff** consists mainly of practicing engineers, scientists, and engineering students. Laboratory sessions are taught by professional scientists, engineers, and Purdue-Calumet faculty. High school math and science teachers are involved as learners allowing them to transfer ideas from the Summer Science Camp program into their classrooms. A series of **field trips** to local businesses and organizations of scientific interest enhances the program activities.

The Engineering and Science Summer Program is proudly sponsored by numerous organizations and industries: Allied Signal Aerospace, Ameritech, Amoco, the Gary Community School Corporation, the Northern Indiana Public Service Company, United States Steel Gary Works, and the School City of East Chicago. This outstanding collaborative effort reflects the belief of everybody involved in assisting under represented students in gaining unique math and sciences learning experiences and increasing their academic aspirations in these fields.

The impressive results of "Purdue Calumet's Science and Engineering Program" are reflected in these former Summer Science Camp students' success stories, all of whom attended the Summer Science Camp for three consecutive years, 1991, 1992, and 1993:

• *Sherene Donaldson* completed high school, salutatorian of her class of 188 students, served as a tutor for the Engineering and Science Summer Program, and received a $20,000 scholarship from the Minority Achievement Program to attend Indiana University at Bloomington, majoring in Pre-Med and Education.

• *Ahui Herrera* graduated from high school in 1994, 10th in his class of 451 students, received a full two-year scholarship from NIPSCO to attend Purdue Calumet University, and scholarships from the Society of Hispanic Professional Engineers, Inland Steel, and other Hispanic community organizations. He is majoring in Mechanical Engineering.

• *Denika Kimbrough* graduated from high school in 1994, valedictorian of her class of 160 students, received a $20, 000 scholarship from U.S. Steel to attend Indiana University at Bloomington as a Biochemistry and Pre-Med major.

These are real examples of how the science community makes its voice heard. •

BEST COPY AVAILABLE

PURDUE UNIVERSITY 50 CALUMET
People Progress Partnerships

MINORITY MIDDLE SCHOOL SUMMER SCIENCE PROGRAM ($M^2 S^3 P$) IN INDIANA

The **"Minority Middle School Summer Science Program" ($M^2 S^3 P$)** at **Purdue University's West Lafayette** campus is the only multidisciplinary science middle school program for under represented students on campus, thanks to funds granted by the **National Science Foundation in 1994.**

The **primary objective** of this four-week academic enhancement and enrichment program is to stimulate under represented middle school students to develop an interest in and a facility for science, and as a result, to choose science as a career. A secondary objective is to foster an improvement of science education in the students' home institutions by encouraging parents to be concerned about the quality of programs in their children's schools, and by reinvigorating teachers through their participation in the program.

To achieve these objectives, 51 under represented 8th grade students from 23 schools (out of 111 applications from 31 schools) and one of their teachers are selected for the summer program on Purdue University's West Lafayette campus.

The Summer Science Camp program uses several approaches: 1) Inquiry-based lecture, discussion, and laboratory experiences that focus on aspects of four areas of science: Biology, Chemistry, Earth and Atmospheric Sciences, and Physics (one per week). Three one-hour mathematics presentations in Cryptography, Mathematical Modeling, History of Mathematics, and Geometry are woven into each week; computers are used in the mathematical sessions. These experiences increase the students' knowledge of these areas, engender a sense that doing science is a quest, rather than merely memorizing facts, and provide an increased awareness of career options in science. 2) Opportunities for careers in science are identified during the daytime lecture, laboratory, and discussion sessions, by visits to laboratories, and by career exploration workshops. Particular emphasis is given to pointing out the issue of under representation of certain groups of society in science. 3) Encouragement of analytical thinking and development of strategies for academic success, in the lectures, labs, and evening sessions. 4) Exercise of communication skills in presenting oral reports of projects in the Biology and Chemistry weeks, and in the Career Development Activities.

Parents attend workshops at the beginning and end of the program that focus on their role in helping their children choose a career, in sustaining their educational efforts, and in being alert to the quality of the academic programs in their childrens' schools.

Parents are an integral part of the program: They attend workshops at the beginning and end of the program that focus on their role in helping their sons and daughters to choose a career, in sustaining their educational efforts, and in being alert to the quality of the academic programs in their sons' and daughters' schools. This turns out to be a very strong component of the summer program activities.

The retention rate of Summer Science Camp participants has been 100%.

To aid in maintaining the enthusiasm generated during the summer, "Saturday Academy" activities are hosted on campus twice during the **academic school year.** Activities include workshops on time management, study habits, saving for college, and financial

aid. Hands-on lab activities involve the students, their parents, and grandparents, working side by side. Lab activities introduce the use of computer simulation in biology, exploring the Internet and World Wide Web, and a mini lecture - inquiry lab on Cartesian divers.

A career education component is offered to participants in three stages: awareness, exploration, and matriculation. This sequence seeks to increase students' knowledge of career options related to sciences. Mentoring and precollege activities are part of this program component.

Program Director Regina Todd-Hicks states that: **"...Data from pre-program and post-program surveys indicate that "Minority Middle School Summer Science Program" has made a positive impact on our students' perceptions that a successful career in science could be theirs. Students exhibited increased knowledge about career options as their responses relating career choice began to extend beyond the traditional choices of medicine or law to non-traditional choices. Female participants in particular showed a significant increase in their interest in physics."**

The following excerpts are exemplary of the many letters of support from **parents** that the program and its director have received. *Parents Mrs. and Mrs. Webb* write: **"...The Science Program has been an experience which will have an impact on our family as well as Jamaal. Jamaal has excelled academically this year and seems to be more self-motivated."**

"Since attending the M²S³P my daughter...has gone from being an average student to a high honor student; being first in her middle school class, with an 11.87 of 12.0 GPA, and is now in the Honors Program at South Side High School."

Parent Mrs. Connie Chandler writes: **"...The last two summers have been very enlightening for me and my daughter Constance. Since she has been attending the M²S³P my daughter ...has gone from being an average student to a high honor student; ...and is on the Honors Program at South Side High School, where she has completed the first semester of her freshman year on the honor roll."**

Parent Linda Chism is enthusiastic: **"...Thanks for a great Saturday Academy! ...It was so interesting seeing the DNA, and watching the kids work in the Physics rooms. ...I'm sending a copy of the certificate she received after the first semester. As I said ..., she is ranked 6th out of 345 freshmen at LaSalle High School. ...She told me that the next time she wanted to be in the top 5."**

Students attest to the program's success, too. *Participant Christina Matthews* writes: **"...M²S³P was a dream come true for me. I went into each new school year with a better perspective of my math and science classes.... Biology is very interesting for me, but in my class at school there are a few times when I get bored with the material. I would enjoy it more if we did more labs."**

Participant Shaira Brooks states: **"...I think that this program has influenced me to be what I want to be. I would like to be a chemist."**

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Purdue University–Calumet Hammond, Indiana	53	5 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9
Purdue University, West Lafayette, Indiana	51	4 weeks	7, 8, 9	1, 2, 3, 4, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SCIENCE WITH A TWIST: TECHNOLOGY EDUCATION ATTRACTING MINORITIES (SWAT-TEAM) IN KENTUCKY

Reaching out to more than one school district and putting in place three four-week commuter Summer Science Programs allows the **Jefferson County Public School District** to receive funding from the **National Science Foundation** for its **"Science with a Twist - Technology Education Attracting Minorities"** Summer Science Camp.

Jefferson County Public School District, site of the Summer Science Camps, is one of only five urban school districts in the Nation selected by the Edna McConnell Clark Foundation to receive a grant to restructure educational programs in middle schools. The National Science Foundation joins this effort!

The three Summer Science Camps known as "Science With A Twist" (SWAT) are held simultaneously at three different middle schools in the Jefferson County Public School District: Iroquois, Southern, and Western Middle Schools. In each middle school, 50 students are selected from 7th, 8th, and 9th grade to participate in the Summer Science Camp, serving 180 students over a span of three years.

The different **curriculum** content offered at each school makes this Summer Science Camp program unique. The activities at Iroquois Middle School focus on the disciplines of environmental sciences, structural design, and orienteering. The Summer Science Camp program at Southern Middle School provides activities in environmental and biological science. The third program held at Western Middle School provides students with activities related to aviation, aerospace dynamics, and forensic science as it applies to criminal justice.

In each program, instructional activities and field trips are built around the curriculum. At Iroquois Middle School, students acquire mapping skills, learn how to scale drawings, are introduced to the use of topographical maps, explore cave formations via laser disc, analyze the construction of buildings and different types of support systems, and explore structural design through the construction of a roller coaster model. At Southern Middle School, students use water quality kits to test water samples taken from the Ohio River, learn about wild and domestic animal life, and

the various environmental services and agencies. At Western Middle School, students acquire basic skills in forensic science, for example DNA testing; participants are also introduced to aspects of space, different plane designs, and the relations between meteorology and aviation/space flight.

A variety of **field trips** is scheduled according to each Summer Science Camp curriculum. Students visit the Hidden River Cave, Marengo Cave, the pond at Iroquois Park, the Jefferson Memorial Forest, the Louisville Police Department, and a meteorology station.

Participants are involved in diverse instructional activities: classroom lectures, lab experiments, testing stations, and team work projects, allowing them to build, for example, an ecological pond with a cascading waterfall, and to employ computer technology and structional design to construct model buildings and roller coasters.

Judging from anecdotal data, the Summer Science Camps in Jefferson County Public Schools are successful! *Samples of quotes taken from from students' journals are:* **"...We made a histogram of how far the plane will go...."**; and **"...Today I enjoyed making the microscope slides and then looking at them."** *Here are a few samples of quotes from guest speakers and staff members:* **"...Excellent opportunities for students. Enthusiastic staff."; "This is my second year with the SWAT program. It was very positive."; "...I would suggest more time for students to talk with staff and to experience the exhibits."**; and **"...Unless the students are exposed to the business environment, how can they know what to expect, what's waiting for them in the future?"**

Dr. Howard K. Hardin, Program Director, states in his assessment of the Summer Science Camp components that the most successful ones in retaining the participants were the field trips and the personal connections the students had with the guest speakers, followed by hands-on activities and experiences encouraging teamwork.

A significant aspect of the "SWAT Summer Science Camp" is the fact that the three middle school sites are located in the Jefferson County Public School District, one of only five urban school districts in the Nation selected by the Edna McConnell Clark Foundation to receive a grant to restructure educational programs in middle schools, characterized by active learning and a strong academic program for students. Hence, the efforts of each grant are closely coordinated.

As *Dr. Hardin* says: **"...it should be noted that before the National Science Foundation Summer Science Camps there had been little or no activities for students during the summer months that enhance their academic skills."** •

"...Unless students are exposed to the business environment, how can they know what to expect, what's waiting for them in the future?"

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Jefferson County Public Schools, Louisville, Kentucky	60	4 weeks	6, 7, 8	1, 2, 3, 4, 5, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

JUNIOR AQUARIST SUMMER SCIENCE CAMP IN MARYLAND

Students are provided with behind-the-scenes, hands-on experiences, and interaction with professional scientists, helping them to acquire an understanding of the educational requirements needed for careers in sciences.

In order to lay the foundation for a lifelong interest in science and research, the **"Junior Aquarist Summer Science Camp"** program attempts to form a lasting relationship between its participants and the **National Aquarium in Baltimore.** Students are encouraged to join the existing "Junior Aquarist Club", to apply for high school, and later college level internships at the National Aquarium. The National Aquarium in Baltimore thus creates a "seamless pipeline" of science activities to maintain the interest in the sciences generated by the Summer Science Camp.

With funding from the **National Science Foundation**, the National Aquarium in Baltimore, a major resource for marine and aquatic science, offers instruction to 20 exceptional 7th through 9th grade students from the Baltimore City and County area during its four-week "Junior Aquarist Summer Science Camp" in 1994 and 1995. Participants are selected according to their teachers' recommendations, grades, interest in science and personal interviews.

The program's **goals** are to encourage an interest in science in these students, so that they continue their involvement in this field. Participants are immersed in the daily routines of maintenance at the National Aquarium in Baltimore. They are provided with behind-the-scenes, hands-on experiences, and interaction with professional scientists, helping them to acquire an understanding of the educational requirements needed for careers in sciences, especially in the study of various aquatic environments, made possible by the tutelage of the Aquarium staff. Learning-by-doing is encouraged through students working in groups of four to design their research projects, which they then carry out and present to their families and friends at the end of the program. These projects make use of the Aquarium's renowned collection of poison arrow frogs!

Instructional activities cover the disciplines of math, science and problem solving. In each summer week, students study the natural history of Chesapeake Bay, investigate tropical rain forests, focus on the analysis of marine environments, and conclude the program with an introduction to the study of marine mammals. **Field trips** to locations like the

NATIONAL AQUARIUM IN BALTIMORE

Jug Bay Wetlands Sanctuary and the National Zoo complement these activities.

Student support through family and peers is encouraged, and scientists and college students serve as mentors.

The program has increased the interest levels and knowledge in science of its participants, instilling a strong interest to attend college and pursue a scientific career among program graduates.

As **follow-up activities**, the National Aquarium in Baltimore trains Summer Science Camp participants as volunteers, offers paying summer jobs, and connects them with additional scholarship programs. All these activities initiate participants into the process of becoming future scientists. These follow-up activities are further enhanced by the creation of a bi-monthly newsletter and field experiments in aquatic science at various locations led by the National Aquarium staff and public school teachers.

Parents attest to the program's success: **"...the "Junior Aquarist Summer Science Camp" has given my son different insights to careers. It has opened many windows, more specifically, careers in science."**

The *Project Evaluator Dr. John Falk* describes the program's success: **"...As a group the participants in the Junior Aquarist Summer Science Camp at the National Aquarium in Baltimore seem to be directed towards successfully becoming future scientists. Their responses show that they do not only want to pursue a career, but in many cases they have already selected a particular field. The students also have a realistic sense of what will be necessary in order to reach their stated career goals."**

> "...If we are to continue to advance in the fields of science and technology, a qualified workforce is needed. The more we can do to interest students in science, engineering, and math-related careers, the better we can meet the demand for scientists."

Program Director Sylvia M. James writes: **"...Whatever the population of students in the program, the goal of the Summer Science Camp is an essential one. If we are to continue to advance in the fields of science and technology, a qualified workforce is needed. The more we can do to interest students in science, engineering, and math related careers, the better we can meet the demand for scientists.... With the support of the National Science Foundation, the National Aquarium in Baltimore is using its resources to create future marine scientists."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
National Aquarium Baltimore, Baltimore, Maryland	40	4 weeks	7, 8, 9	1, 2, 4, 5, 7 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

CAMP TECH SUMMER SCIENCE CAMP IN MASSACHUSETTS

The **Massachusetts Pre-Engineering Program (MassPEP), Inc.** began holding a summer program called "Camp Tech" in 1991 as a collaborative project with Wentworth Institute of Technology (WIT), the Boston Housing Authority, and Boston's East Zone elementary school district. The project was funded by the Dwight D. Eisenhower Math and Science Education Program, the Sloan Foundation, the Hyams Foundation, and several local industry sponsors.

From 1991 to the present the "Camp Tech" summer science program has been housed at the Wentworth Institute of Technology (WIT). A leader in applied engineering and technology education, WIT is uniquely qualified to educate young people and influence their interests in mathematics, sciences, and technology through the "Camp Tech" summer science program. This program successfully reinforces mathematics and science concepts through technology applications at the elementary level, its integrated curriculum approach to mathematics and sciences serves as the framework of support for the program's activities. WIT furnishes "Camp Tech" summer science program with space and facilities for over 100 children.

In 1994, "Camp Tech" summer science program was awarded a grant by the National Science Foundation Summer Science Camp Program to serve 30 under represented students in 7th through 9th grade selected from Boston, Cambridge, and Chelsea public schools.

This four-week commuter program's **goal** is to participate in the national effort to increase participation of under represented groups in the fields of engineering, math, and sciences by preparing them for college studies in these areas.

The "Camp Tech" Summer Science Camp offers its 30 National Science

"Camp Tech" Summer Science Camp students are introduced to computer applications in aviation.

BEST COPY AVAILABLE

Foundation participants the opportunity to be involved in four different "theme" sessions according to their grade levels. The 7th and 8th grade participants attend programs in "Aviation", "Marsville: The Cosmic Village", or "Designs". Students entering 9th grade participate in "Multimedia", "Photography", or "Environmental Studies" projects. The "Designs" module is offered in collaboration with the Harvard-Smithsonian Center for Astrophysics and the Science Education Department. Participants build and test devices of their own design as a method for discovery and exploration of major scientific concepts; they are engaged in design competitions, and teamwork is encouraged. A few examples of devices students built are mini-motors, electromagnets, and model bridges. Participants in the "Aviation" module increase their knowledge of the physical sciences as they explore the "how and why" of airplane design, construction and flight. Hanscom Airforce Base supplies the research facility for participants as they put theory into practice on actual flights.

The "Camp Tech" Summer Science Camp **staff** includes instructors from a variety of educational and industrial organizations and groups: University faculty from the Wentworth Institute of Technology, middle school teachers, engineers from Draper Labs in Cambridge, the Federal Aviation Association and Space Systems 3 in Rockland. Students from the University of Massachusetts in Boston, and the Massachusetts Institute of Technology in Cambridge work alongside high school students as teaching assistants, mentors and role models for the young participants. **Career exploration opportunities** are provided constantly through the close interaction with successful scientists, mathematicians, and engineers during the "Camp Tech" Summer Science Camp program activities. **Field trips** make use of Boston's many resources in the fields of science and engineering.

Academic year follow-up activities are scheduled on five Saturdays, focusing on further extensive introduction to the Internet and the World Wide Web, along with classroom and laboratory science projects, activities, and academic counseling.

Academic year follow-up activities are scheduled on five Saturdays, focusing on further extensive introduction to the Internet and the World Wide Web, along with classroom and laboratory science projects, activities, and academic counseling.

MassPEP's Executive Director, Joyce P. Newhouse highlights the Summer Science Camp"Camp Tech" by stating: **"...One primary goal is to stimulate the natural curiosity of the students so that he/she becomes an active participant in the learning process and hopefully chooses a career in the science, math, engineering, and technology fields."** •

MASSPEP

ON DECK 2000 SUMMER SCIENCE CAMP IN MASSACHUSETTS

One hundred highly motivated disadvantaged middle school students from Boston schools have the opportunity to learn what it takes to become a scientist or engineer through the Science Resource Center's four-week commuter Summer Science Camp "On Deck 2000", which was awarded funding from the National Science Foundation from 1993 to 1996.

The Summer Science Camp's **goals** are to strengthen participants' commitment to remain in school, to continue the study of math and science, and to provide career information on math, sciences, and engineering professions.

The "On Deck 2000" Summer Science Camp curriculum reflects the very best in educational research today. Its goal is to provide students with a range of challenging hands-on educational experiences which enhance critical thinking skills in order to prepare students for the technically oriented careers of the 21st century. The Summer Science Camp takes place at both the Massachusetts Institute of Technology for students who are attending the program for the third year, and at the Burke High School for first and second year participants. The **curriculum** has continuously been revised to meet the challenging needs of its participants. During the first year, the curriculum focused on chemistry, computer science, astronomy, physics, mathematics, and aerodynamics. The second year curriculum provided instructional activities in pre-algebra, earth and computer science. The third year program engages participants in learning experiences in algebra, computer and physical science, and bridge building with an emphasis on inquiry-based, hands-on instructional approaches.

A **staff** of school teachers and college mentors who are science and engineering majors facilitates "On Deck 2000's" learning activities.

Participants attend guest lectures by local scientists and engineers, who provide **career exploration** opportunities. On Fridays they embark on **field trips** to the Boston Computer Museum, the Boston Museum of Science, and the Woods Hole Marine Biological Laboratory, which link the the classroom theory to the relevance of science in the real world.

The Summer Science Camp program culminates with a science exposition at the Massachusetts Institute of Technology, where students display special technology or engineering projects and present the results of their research.

Academic year follow-up activities enroll students in the Boston Museum of Science's "Science by Mail" Program, which links participants with practicing scientists to provide assistance with the work on students' individual research projects. A significant follow-up activity is the linkage of "On Deck 2000" with the "Partners In Math And Science" (PIMS) project. "On Deck 2000" students are invited to participate in special science research projects to be submitted at local and regional science olympiads. The "On Deck 2000" students' involvement and commitment to their science projects resulted in several winners at mathematics and science olympiads!

In 1995, "On Deck 2000" participants *Breneley Bodden, Monique Mack, Felicia Philips,* and *Lucelina Barros* were winners in Boston Science Olympiads with their Summer Science Camp based science projects. Breneley Bodden and Monique Mack also won fourth and second place respectively at the Regional Alpha Kappa Alpha Sorority, Inc. Math Science Olympiad in New Jersey for their projects "Yeasts, Sugars, and Carbon Dioxide" and "Birds fly! Why can't I?". This is proof that "On Deck 2000" makes excellent use of its National Science Foundation funds! •

The "On Deck 2000" students' involvement and commitment to their science projects resulted in several winners at mathematics and science olympiads!

SCIENCE HIGH ACHIEVEMENT RESOURCES PROGRAM (SHARP) IN MASSACHUSETTS

The **University of Massachusetts at Lowell (UML)** received funding from the **National Science Foundation** in 1995 to conduct the four-week commuter **"Science High Achievement Resources Program" (SHARP)** Summer Science Camp on its campus for 50 under represented middle school students from Boston and Lowell area schools. The "Science High Achievement Resources Program" is coordinated by the Engineering & Scientific Resources for Advancement, Inc. (ESRA), an experienced organization dedicated to providing access to science, engineering, math, and technology fields for under represented groups.

> The program is dedicated to providing access to science, engineering, math, and technology to under represented groups.

The "Science High Achievement Resources Program" is an exciting, multi-faceted Summer Science Camp seeking: to increase participants' understanding and appreciation of sciences, mathematics, engineering, and technology careers; to raise students' ability to solve real-life problems using sciences and mathematics concepts; to provide positive exposure and orientation regarding the college experience, including the academic, cultural, and societal dimensions; and to increase participants' understanding of business and community dynamics, promoting career awareness and leadership skills.

The "SHARP" **curriculum** is built along a list of learning modules with related hands-on projects: The mathematics and science module "Making It in Math" emphasizes mathematics techniques for solving complex problems, basic mathematics applications, fractions, decimals, scientific notation, graphing, basic algebra, and personal budgets. "Fun With Chemistry" introduces participants to principles of volcanoes, while building their own volcanoes to make them erupt. Students explore energy, the use of microscopes, radio communications, engineering principles, physics, and photography. All these mathematics and sciences activities are accompanied by attendants working on their individual science fair projects, assisted by the "SHARP" **staff.** These sciences and mathematics projects are exhibited during the final week of the summer program.

The "Economic and Community Leadership" learning module exposes the middle school students to a variety of business leaders from the community, who present workshops on topics like savings accounts, budgeting, entrepreneurship, financial issues, civic education, and community leadership.

The "Health Education and Performing Arts" modules inform participants about critical societal issues. The students receive instruction in music, dance, and acting to complement their educational development.

The "Computer Education" modules takes place at the University of Massachusetts at Lowell's computer facilities to introduce students to the use of calculators and other technological tools. A strong emphasis is placed on writing skills development by working with the computer word processing programs and writing a journal reflecting on participants' individual experience in the "Science High Achievement Resources Program", which has the following weekly schedule: Mondays are selected for **field trips** and hands-on sciences and mathematics projects. Tuesdays through Thursdays the attendants receive mathematics, sciences, computer, business, and civic instruction. On Fridays students engage in Health Education and Writing Lab activities, complemented by additional field trips in the morning. In the afternoons mathematics and science modules round off the week.

Parental involvement is achieved via an initial orientation meeting, attendance of the closing ceremony, and a special follow-up event in late September, focusing on assisting in their child's education.

Academic year follow-up activities are offered to all "Science High Achievement Resources Program" participants, inciting them to enroll in other mathematics and sciences precollege programs, in the Museum of Science's "Science by Mail" program, and further school enrichment opportunities. •

BENTLEY COLLEGE'S SCIENCE HORIZONS — A SUMMER MATH/SCIENCE CAMP FOR GIRLS IN MASSACHUSETTS

"...The Summer Science Camp is for girls only. All camp counselors/ mentors are female, and six of seven faculty members are women. This provides the female participants with excellent role models in the field of education and science."

A core component of **"Bentley College's Science Horizons - A Summer Math/Science Camp for Girls"** is based on a three-week pilot program offered at Bentley College in the summer of 1993 for 15 girls. This project utilized a curriculum in which age-appropriate mathematics were integrated with chemistry lab experiments promoting teamwork and cooperative learning styles, focusing specifically on content issues relevant to female students.

By 1994, the **National Science Foundation** sponsored Bentley College to conduct this four-week residential Summer Science Camp for 50 girls from under represented groups entering 7th, 8th, and 9th grade, and selected from five schools in Boston and Cambridge. The major criteria for selection are motivation and an interest in science and math.

Working with TI-80 calculators and pie charts is challenging at "Bentley College's Science Horizons!"

Additional grants were received from private sources: ThermoElectron, Millipore Foundation, and First Eastern. These funds provided access to the program for students from other local areas, camp counselors' scholarships, and supplemental teacher training.

Bentley College's "Science Horizons" Summer Science Camp designed a different **curriculum** for each summer and intervening academic year. The 1995 summer component focused on biology experiences, geology studies, and chemical water constituents. The "Science Horizons" Summer 1996 program focuses on environmental science. Students investigate the environmental health of watershed areas, and are engaged in plant investigations, building on the 1995 biology component.

Participants hence have the opportunity to be involved in activities similar to the work and study of individuals in the disciplines of astronomy, biology, chemistry, geology, math, and computer science on the College's campus. They view and study the late night sky with the aid of a telescope. Microscopes are used to view cross sections of plant stems, leaves, and worms, and students produce full-page scale drawings of their observations. A four-week-long study of plants growing under extreme conditions - salt, acid rain, etc. - is a major project in the Summer Science Camp. In the geology lab,

BEST COPY AVAILABLE

Measuring the vitamin c content in fruit juice is only one of many science lab activities for the summer camp attendants.

the identification of common minerals is achieved by crystal cleavage, hardness and streak color observations. Here, students examine the composition of soils using simple sediment tests. "Soils" are created by mixing components, and are then subjected to "earthquake conditions" to see how well the specific soil could support a structure. Students are introduced to working with the graphic calculator and computers. The chemistry component involves the study of vitamin C content in fruit juices assisted by a staff of college faculty, middle school teachers, and college student counselors.

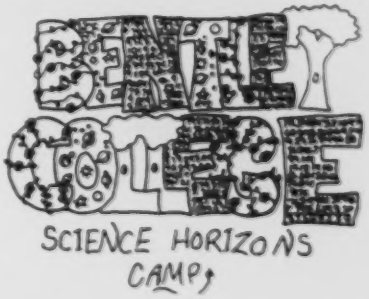
Program Director Dr. Robert W. Wallace describes the uniqueness of the program: **"...The Summer Science Camp is for girls only. All camp counselors/mentors are female, and six of seven faculty members are women. This provides the female participants with excellent role models in the field of education and science."**

Field trips connect the theory of laboratory and classroom work on campus to the world outside. Participants visit the Boston Museum of Science's Hayden Planetarium, the Westford Butterfly Park, and Boston College's Weston Seismic Observatory.

Academic year follow-up activities continue to involve the students in classroom and laboratory study. The academic year focus on human nutrition involved students in maintaining and analyzing their own food diary, and discussing the make-up of a well-balanced diet. In the laboratory, they analyzed starch, sugar, sodium, and fat levels in popular foods.

The success of the Science Horizons' program manifests itself in its 1995 summer student retention rate of 94%, and 100% during the academic year. The program already has a waiting list for the summer of 1996!

Angela Atkinson from the Mother Caroline Academy has only positive things to say about Science Horizons: **"...The Science Horizons Summer Science Camp at Bentley College has received great reviews, from both parents and students.... These positive experiences with science on a college campus will have a great effect on our young students' lives."** •



Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Massachusetts Pre-Engineering Program, Inc., Boston, Massachusetts	30	6 weeks	7, 8, 9	1, 2, 3, 4, 6, 7, 8, 9, 10
Science Resource Center, Inc. Dorchester, Massachusetts	50	4 weeks	6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
University of Massachusetts at Lowell, Massachusetts	50	4 weeks	7, 8, 9	1, 2, 4, 5, 6, 7, 8, 9, 10
Bentley College, Waltham, Massachusetts	50	4 weeks	7, 8, 9	1, 2, 4, 5, 6, 7, 8, 9

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

DAPCEP: UNIVERSITY OF DETROIT PAPER VEHICLE PROJECT IN MICHIGAN

Can the National Science Foundation fund a Summer Science Camp where middle school students study, design and build two life-size vehicles made entirely from paper products? The answer is: Yes!

The **"Detroit Area Pre-College Engineering Program" (DAPCEP) - University of Detroit Paper Vehicle Project"** on the University of Detroit Mercy campus is a five-week program for 55 under represented 8th and 9th grade students from six different school districts in metropolitan Detroit. This Summer Science Camp, held in 1994, 1995 and 1996, is an extension of the current General Motors/DAPCEP "Paper Vehicle Project" designed for high schools students. The project's high school curriculum is adapted to middle school level for the Summer Science Camp program with the objective of reaching students before high school and sparking a lasting interest in the engineering field. **"...High school is almost too late to interest students in engineering,"** says one of the *program developers, Mark Thomas.* **"...They have a lot of catching up to do in order to be accepted into engineering school. We have to reach them at an earlier age."**

Participants put the final touches on one of the cars made entirely from paper products.

It is worth mentioning that the "Paper Vehicle Project" is based on a concept developed by General Motors engineers Elliot Lyons, Vincent Lyons, and Mark Thomas during their studies at Stanford University.

DAPCEP's ultimate **goal** is to give under represented students the interest and preparation they need to succeed in a university-level science or engineering curriculum.

During the Summer Science Camp, students commute to University of Detroit Mercy's central campus during the first four weeks, and live in residence halls the final week. The 50 participants are divided into two project teams for classes, lectures, build days and **field trips** to Detroit manufacturing facilities and landmarks such as the American Sunroof Corporation, the Henry Ford Museum, and the Detroit Science Center. The DAPCEP Summer Science Camp **curriculum** teaches students to formulate questions, organize information, present research papers, use and expand their research skills for science fair projects, and write and prepare their minority contribution notebook.

During a five-week course in automobile engineering held at the University of Detroit at Mercy, participants in each group design and build a separate vehicle, crafted from cardboard, paper - mache, and other paper products, utilizing and testing their knowledge in

BEST COPY AVAILABLE

DETROIT AREA PRE•COLLEGE ENGINEERING PROGRAM

DAPCEP

During a five-week course in automobile engineering, middle school participants design and build a vehicle, crafted from cardboard and paper, utilizing knowledge in disciplines like aerodynamics and ergonomics.

disciplines like aerodynamics and ergonomics. The students are mentored by a **staff** of General Motors engineers, University of Detroit Mercy instructors, college student assistants, and high school teachers, who provide direction and offer instruction in aerodynamics, suspension power train, and ergonomics.

"...We tell them to build a vehicle out of paper, and then they discover they need math to build it," says *Arthur Haman, Associate Dean of Engineering and Science at University of Detroit Mercy,* **"...Without telling them, we teach them what they need to know to do the job. We like to experiment. This is a learning experience for everyone involved."**

Program assistant Kate Callas states: **"...Student benefits of the project include living in a collegiate setting, learning about engineering by visiting the workplace, working in a mentor relationship with practicing engineers, receiving instruction from high school and university instructors, working as a team with other bright, motivated young people to produce a vehicle of their own design, and the opportunity to build communication skills and poise by presenting the results of their activities to a large and interested audience."**

A field trip to the American Sunroof/Automobile Specialty Company (ASC, Inc.) allows participants to observe vehicles in various stages. *Sharon P. Kelsey, ASC Communications Specialist* writes: **"...A unique aspect of the group was that they were 'building' a paper vehicle. While we do not use paper as a medium, they were able to see vehicles in various stages - clay, body in white, etc.. I believe this ...helped them understand how everything fits together."**

The two cars are unveiled at the Summer Science Camp's closing ceremony and presented by the students to an audience of **parents,** community members, and representatives of UDM and General Motors.

In 1995, the closing ceremony was broadcast on the local news channel WDIV TV-4. General Motors promoted DAPCEP's Summer Science Camp with a two-page full-color ad in a number of national magazines like Newsweek, Ebony, Forbes, and Black Enterprise.

"...Collaboration is what makes our program unique," says *DAPCEP Executive Director Kenneth Hill.* **"...Not only did the students learn teamwork by working with each other, and with a group of engineers and educators, but the project itself was an exercise in collaboration. Individually, the partners in this project could not have secured this funding. We were able to put together a very competitive proposal by drawing on the strengths and combined resources of General Motors, UDM, and DAPCEP."**

DAPCEP receives support from 30 local corporations, the Detroit Public Schools, the State of Michigan, and the National Science Foundation, among others, and represents one of the largest partnerships for a Summer Science Camp program. All students who participated in the 1994 and 1995 DAPCEP Summer Science Camps continued in other DAPCEP programs.

Associate Dean Arthur C. Haman says: **"...The beauty of the program is that the learning does not stop when the summer is over.... through the academic year ...we provide a learning environment ...until graduation from high school and beyond."**

DAPCEP has received national recognition for its programs, including summer enrichment programs like the Summer Science Camp. •

MICHIGAN MATHEMATICS-SCIENCE SUMMER CAMP & SATURDAY ACADEMY

"Participants...become a team through democratic group living and shared experiences, returning to their parents with increased enthusiasm for science and more confidence for having survived."

Local newspapers, radio and television stations, churches, and schools are enlisted to promote the Summer Science Camp at Michigan State University. **Michigan State University** received funding from the **National Science Foundation** from 1993 to 1995 to set up the **"Michigan Mathematics-Science Summer Camp and Saturday Academy"**, a five-week summer enrichment program for 170 under represented 7th, 8th, and 9th grade students at three different project sites: Lansing, Pontiac, and Benton Harbor. The respective community agencies at the three locations -- the "Black Child and Family Institute" in Lansing, the "Association for Leadership Development" in Pontiac, and the "Benton Harbor's Independent School System" – collaborate with Michigan State University and the National Science Foundation to provide this Summer Science Camp.

"...Our mission is to encourage middle school students to increase their knowledge of mathematics, science, and computer science, strive for excellence in their education, begin in middle school to prepare for college and a career, prepare themselves academically to compete globally and increase their awareness of the importance of technology and its practical applications in everyday life," declares *Program Director Dr. Irvin E. Vance.*

Participants meet at the Michigan State University campus for four weeks during the summer. Here they are immersed in a **curriculum** of hands-on mathematics, sciences, and computer sciences instruction. Students are led to utilize and apply mathematics to real life situations. All math activities foster the development of problem solving and critical thinking skills. The hands-on science activities are designed to force students to take on the role of a scientist and employ their observation, journal writing, classification, data collecting, and analyzing skills in a science project-based format. The disciplines of ecology, biology, geology, space science, chemistry, meteorology, and physics are incorporated into the sciences module. In the computer science module, students are encouraged to access the Internet for

Parental involvement is high at the "Michigan Mathematics – Science Summer Camp and Saturday Academy."

Attendants working attentively in the computer laboratory.

information on their respective science projects.

A diverse **staff** of high school teachers, graduate and undergraduate student tutors and mentors shares the common goal to encourage teamwork, and to provide the Summer Science Camp participants with innovative, creative learning experiences that transcend the traditional classroom activities.

The last summer week is spent at the Leenau Center for Education, a residential science camp location on the shores of Lake Michigan, allowing participants to do science research and be involved in environmental field studies by investigating pollution and water quality. Sleeping Bear Dunes National Lakeshore, a 76,000 acre National Park featuring unique and varied ecosystems, provides an extensive outdoor laboratory.

"...The residential camp is a 'transforming' experience that can not be duplicated in a regular classroom. Many of the students have never been away from home and find themselves in very 'strange' habitats, sharing spaces with animal and plant life not seen in their urban home communities. Their many fears soon give way to the exhilaration of mastering new skills and accomplishing new feats. They ...become a team through democratic group living and shared experiences, returning to their parents with increased enthusiasm for science and more confidence for having survived," explains *Program Director Dr. Irvin E. Vance.*

A **field trip** to the NASA Training Space Camp at Cape Canaveral in Florida allows for real life applications on-site for the aerospace classroom theory. Other field trips to educational institutions, local industries, and science museums provide ample opportunity to explore the many career options in the field of sciences and technology and reinforce current classroom investigations.

Parents are encouraged to participate in all program activities. They serve as chaperones on field trips, serve on various committees, arrange for professional guest speakers to share their career information, and set up visits to local industries.

A Science Fair at the end of the summer session allows participants to compete and to display their science research projects.

Academic year follow-up sessions are scheduled for Saturdays to continue the academic enhancement and enrichment process started during the summer. Career and academic counseling are other strong foci of these Saturday Academies.

Parents' comments such as these underline the overall positive outcomes and evaluation of the program: *One parent* writes: **"...My daughter has benefited greatly from your Summer Science Camp program. She has gained confidence in math and more interest in sciences. She is now considering medicine as a career."**; and *another parent* states: **"...It was the most positive practical educational experience my son has ever had."** •

SUMMER ENVIRONMENT CAMP IN YPSILANTI IN MICHIGAN

Eastern Michigan University offers four weeks of hands-on science, real-life mathematics, and computer simulations in the 1996 residential Summer Science Camp, called **"Summer Environment Camp in Ypsilanti"**, in Michigan thanks to a grant from the **National Science Foundation.**

The program's **goal** is to increase students' awareness and understanding of water quality, air, and land resources; all focusing on environmental issues related to the Great Lakes. Participants motivation towards mathematics and sciences is boosted by involving them in research activities.

Dr. Joanne Caniglia, Principal Investigator, states that, "The Summer Environmental Camp will specifically address the interdependence of water, air and energy resources, to provide students with a knowledge base of natural systems. Students use this understanding to make informed decisions on difficult ecological issues."

Fifty-seven gifted, under represented 7th grade students from schools in the cities of Adrian, Detroit, Flint, Pontiac, Willow Run, and Ypsilanti are involved in a variety of activities during the summer science program focusing on the theme: "Environment".

writing a newspaper, and meeting students from Southeast Michigan. In accordance with the environmental focus, the Summer Science Camp utilizes three types of instructional approaches: "workshops", "explorations", and "discussions", to provide the students with an in-depth study of research methodologies, effective communication skills, and a knowledge base of technology and mathematics.

The **instructional staff** is comprised of both Eastern Michigan University faculty and guest speakers from the area.

The "workshops" are held in the mornings, and in the afternoons "explorations" offer students a broad range of academic experiences in environmental topics. Evening "discussions" sessions focus on career and academic advising in the areas of biology and mathematics.

BEST COPY AVAILABLE

A beautiful view of Eastern Michigan University's general campus, the site of the "Summer Environment Camp."

Field trips, such as tours of the automobile emission test site, Metro Parks Canoe Adventure, the Ann Arbor Landfill, and the Leslie Science Center, occur before the "exploration" sessions, to make the latter more meaningful to the students. Although Eastern Michigan University's campus is the site of the Summer Science Camp, participants are engaged for one week in activities at the Kresse Environmental Education Center.

Follow-up activities during the academic year focus on further academic advisement through Eastern Michigan University staff. Students are introduced to and informed about college requirements and career choices. **Parents** are invited to join their children in these activities and workshops.

Dr. Joanne Caniglia, Program Director, clearly defines the Summer Science Camp program: **"...Recognizing the importance to understand the interrelationships of natural resources and ecosystems, the Eastern Michigan University's Summer Environmental Camp will specifically address the interdependence of water, air and energy resources.... Activities will draw from students the concepts of change, adaptation, and diversity."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Detroit Area Pre-College Engineering Program, Detroit, Michigan	50	5 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Michigan State University, East Lansing, Michigan	170	5 weeks	7, 8, 9	1, 2, 4, 6, 7 8, 9, 10
Eastern Michigan University, Ypsilanti, Michigan	57	4 weeks	7	1, 2, 3, 4, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

NATIVE AMERICAN STUDYING SCIENCE CAMP IN MINNESOTA

Three different locations - Duluth in Minnesota, Green Bay in Wisconsin, and Tama in Iowa - serve to hold the **"Native American Studying Science Camp" (NASS CAMP)** funded by the **National Science Foundation** from 1992 to 1995. The **University of Minnesota at Duluth** selects annually 36 under represented 7th and 8th grade students with the opportunity to participate in this Summer Science Camp.

The **curriculum** focuses on the Anishinabe's use of natural resources, and the preservation and management of these natural resources combined with American Indian traditions. Through classroom activities, lectures, demonstrations, and field trips the students experience and learn about traditional uses of materials such as wild rice, sage, sweet grass, birch bark, and fish.

"...Most of the American Indian students in our region have not had very encouraging school experiences in science or mathematics," says *Maria Hamlin, Program Director for NASS Camp.* **"...Through summer programs such as ours, we help these students to find both relevance and success in studying science and mathematics. We also introduce them to the University of Minnesota at Duluth campus..."**

Participants work on different scientific research projects in cooperative groups and discuss their results with professional scientists, university faculty, graduate students and Native American community members. Native American high school students are brought into the program in order to advise Summer Science Camp participants and act as role models for them.

Field trip experiences include an exploration of the geology of the region, an introduction to field research technologies at Minnesota Power's Boulder Lake Management Area, and a water quality investigation carried out aboard a research vessel on Lake Superior under the supervision of the program staff and community leaders.

"Native American Studying Science Camp" participants examine water quality parameters aboard a Lake Superior research vessel.

Students complete a science project that involves preparing a garden on the Fond-du-Lac Reservation.

Dr. H. Mitzi Doane, Dean of the College of Education and Health Service Professions at the University of Minnesota argues strongly for NASS Camp: **"...I understand from our recent conversation that the National Science Foundation is planning to reduce their support for Summer Science Camp programs for under represented groups. I strongly oppose that decision and would like to go on record as supporting Summer Science Camp programs such as the NASS (Native American Summer Science) Camp that you've coordinated through the National Science Foundation the past three years.... Summer Science Camp programs are not a single answer to reforming some of our current, unsuccessful educational practices. Summer Science Camp programs do not, by themselves, represent systemic reform of our education system. But, Summer Science Camp programs can and should be one piece of the solution to the problem.... Historically, some groups have not been well represented in science, engineering and mathematics. We need students with a commitment to these fields, and we need under represented students who will choose to become educators in these fields. Summer programming is a critical link in connecting higher education to the broader community.... Through summer programming such as Summer Science Camps, students have access to unique experiences where they can explore activities, skills and potential careers in science, engineering and mathematics. Summer experiences offer a safe atmosphere for experiences and learning where students have their backgrounds and perspectives recognized and honored.**

"...Summer Science Camp programs do not, by themselves, represent systemic reform of our education system. But, Summer Science Programs can and should be one piece of the solution to the problem..."

Summer experiences offer an atmosphere where under represented students can receive support from their peers and encouragement from successful role models. Too many of these students do not receive these opportunities as part of their normal school experience."

Key follow-up activities during the academic year center around parental visits to the University of Minnesota campus to receive college related information, the creation and publication of a Summer Science Camp newsletter discussing school math and science topics by participants, Saturday programs on topics such as rocketry and solar energy, and field trips.

A long-term goal is to follow-up the graduates of NASS Camp, and to strongly encourage them to enroll in the University of Minnesota's science programs.

Parents like Dawn Paro-Strother strongly support the program: **"...I am writing in support of the 'Native American Studying Science Camp'. My daughter has shown a strong interest in the science field because of the wonderful hands-on experiences she has had in the two years at NASS Camp. Without this program and others like it, female students do not stand a chance to even consider the sciences as a career.... The NSF has my greatest gratitude for funding and supporting my daughter and other students ...."** •

RIVERGIRLS ECOLOGY CAMP SUMMER SCIENCE CAMP IN MINNESOTA

"...Because the program was specifically designed for adolescent girls who experience a notable drop in interest and self-confidence in science and math, there was a special emphasis on providing students with positive role models."

The Science Museum of Minnesota conducts the newly funded **National Science Foundation "RiverGirls Ecology Camp"**. This four-week commuter Summer Science Camp for 45 under represented female students entering 7th and 8th grade is held at Mounds Park All Natures School.

Project Director Kit Wilhite says: **"...Our Summer Science Camp is unique because of its focus on junior high school girls ...We provide positive role models and career exploration opportunities for young women."**

The project attempts to increase the number of under represented female students being exposed to scientific fields, and to enhance their scientific knowledge by providing them with hands-on, highly motivating science activities in conjunction with the appropriate technical education and support networks. Ultimately, participants' aptitude in science is brought to a level that allows them to continue exploring science in extracurricular activities and precollege science courses.

Strong partnerships are established among the "RiverGirls Ecology Summer Science Camp" and Medtronic Industries, Operation SMART, the YMCA of St. Paul, the Hispanic Pre-College Project, and the Mt. Olivet Baptist Church, all of them providing recruitment techniques, materials and other support necessary to the Summer Science Camp.

The "RiverGirls Ecology Summer Science Camp" **curriculum** has an overall focus on Urban and Rural River Ecology. Participants take classes in physics, math, biology, botany, geology, microbiology, and taxonomy, enhanced through hands-on activities. A daily hour of team building activities is scheduled with an emphasis on participants learning how to take ownership of what they know and have learned.

Group cooperation, communication and public presentation skills are acquired as prerequisites for educational success. Participants pick their own science research topic, do the research and present their results to peers and **parents** at the ceremony event at the end of the Summer Science Camp program.

Field research methods are emphasized on **field trips** to Crosby Nature Center, the Minnesota River Valley National Wildlife Refuge, and Warner Nature Center. Career pathways in

urban ecology, physiology, anatomy, medical devices and engineering are explored and reinforced on field trips to Medtronic Industries and the University of Minnesota College of Biological Science, both led by female scientists. This close contact with female scientists in industry and academia strengthens participants' self-awareness and self-esteem.

Project Direct Kit Wilhite explains that **"...because the program was specifically designed for adolescent girls who experience a notable drop in interest and self-confidence in science and math ...there was a special emphasis on ...positive role models."**

The "RiverGirls Ecology Camp" staff is mostly female. Teachers, graduate and undergraduate students as well as high school students act as mentors and counselors to the program participants. All staff members serve as excellent role models for the attendants, as is reflected in *one student's comment:* **"...There are not many black female scientists.... I feel the need; this is what I am going to do...."**

In the final program evaluation, all parents said that their daughters had been positively impacted by camp experience. One *program participant* said: **"...I didn't know there was so much you could do with science; didn't know there were so many different things in science like taxonomy; I didn't know that was science."**

Students in the "RiverGirls Ecology Camp" are engaged in a hands-on science activity.

One program participant was selected from the 1995 Summer Science Camp to present her group's research project at the National Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C.

Follow-up activities during the academic year involve the participants' families, and include meetings with female career scientists, as well as internships with the Science Museum of Minnesota. •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
University of Minnesota at Duluth, Minnesota	36	4 weeks	7, 8	1, 2, 3, 4, 5 6, 7, 8, 9
Science Museum of Minnesota, St. Paul, Minnesota	47	4 weeks	7, 8	1, 2, 3, 4, 5 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SCHOOL OF SCIENCE AND TECHNOLOGY SUMMER SCIENCE CAMP IN MISSISSIPPI

Jackson State University's four-week intensive, residential **Summer Science Camp** led participant *Janell Thompson* to sum up her experience and successful completion of the program as follows: **"...and I attended the 'Summer Science and Math Program' last summer. Attending this program had a great effect on my science fair project...At the local level I won 1st place in my category at Powell Middle School and a Benjamin Banaker Award for outstanding research. At the regional level I won 1st place in my category and a NASA Space Grant provided by the University of Mississippi to attend the space camp in Huntsville, Alabama."**

From 1993 to 1995 the program annually selected 48 under represented 7th and 8th grade students to participate in this **National Science Foundation** sponsored Summer Science Camp, which was funded again for the summer of 1996.

Its **goals** are: to provide these participants with instruction in and a challenging **curricular** approach to the study of sciences, mathematics, computer science, and writing skills; to expose participants to professionals in those areas and to explore career options in these fields; to provide intellectually rewarding experiences which are not a part of the regular school curriculum; to acquaint participants with the environment and resources of universities, colleges and research organizations.

Summer Science Camp students at Jackson State University are required to enter a science fair project in the fairs sponsored by their home schools. To assist them in achieving this goal, the science component of the academic year program is designed to help students meet this requirement.

Their preparation begins with a review of the scientific method. This review encourages the students to choose science projects that require experimentation and research as opposed to demonstration. A schedule is developed for each

Attendants on an exciting, educational field trip to Stennis Space Center.

student that allows adequate time to complete each of the seven steps necessary to prepare a science fair project before their local fairs begin. Each participant proceeds through the steps which include 1) selecting a topic; 2) conducting library research on the topic, 3) establishing a purpose and hypothesis, 4) conducting an experiment, 5) writing a research paper, 6) preparing an exhibit for their experiment, and 7) preparing for judging. Success in this endeavor depends largely on parental involvement, as well as Summer Science Camp faculty support. All available resources are at the participants' disposal and their use is encouraged.

Two months before local fairs begin, students make presentations to the Summer Science Camp faculty and the other attendants. The projects are then critiqued and both, strengths and weaknesses are identified.

As a result of this mentoring process, students that had not previously entered science fairs now participate, and those with previous entries improve their project presentation skills. The majority of all Summer Science Camp participants entering the fair last year won first, second, or third place, and some went on to compete in district and/or state fairs. Several students' projects were also chosen as "Best of Fair".

The participation of Summer Science Camp students in science fairs is successful for the following reasons: It exposes students to research-oriented projects; gives them a taste of what a career as a scientist can involve; helps instill the discipline required by science; and aids participants' understanding of the importance of scientific investigation and the role it may play in their lives as future scientists in our world.

Motivational and scientific seminar speakers and **field trips** to scientific landmarks like the Stennis Space Center and the Aquarium of the Americas introduce the middle school students to careers in sciences.

Parent support groups meet once a week to plan activities that could enhance the Summer Science Camp program.

The summer component culminates with an awards ceremony for attendants, parents, and staff.

The **follow-up program during the academic year** shows that all participants significantly improved their scores in school after attending the Summer Science Camp. They all continue in similar programs through grade 12, and each student's entire academic career is tracked.

JACKSON STATE UNIVERSITY
JACKSON, MISSISSIPPI 39217

Jackson State University Dean Dr. Abdul K. Mohamed expresses his support for the National Science Foundation Summer Science Camp as follows: **"...The impact that the program has generated since it was established has been extraordinary...Data indicate that over 90% of the participants are enrolled in college science and math courses, and the completion rates have been equally impressive....
We must do everything possible to ensure that Summer Science Camp funding is continued."** •

"...The impact that the program has generated since it was established has been extraordinary...over 90% of the participants are enrolled in college science and math courses....We must do everything possible to ensure that Summer Science Camp funding is continued."

FUTURE INVESTIGATORS EXPLORING SCIENCE THROUGH ACTION (FIESTA) IN MISSISSIPPI

With funding from the **National Science Foundation**, Mississippi State University plans its 1996 Summer Science Camp, **"Future Investigators Exploring Science Through Action" (FIESTA)**, over a four-week period for 50 under represented students in 7th or 8th grade.

The FIESTA science module centers on concepts in biology, chemistry, and physics. The actual learning of factual science information is not the focus of the **curriculum**, instead, the program seeks to train these young students in the skills that scientists need regardless of their field of expertise: measuring, observing, classifying, and experimenting are all skills not solely attributed to science. The mathematics curriculum incorporates skills related to sciences such as proportional reasoning, measuring, and graphing.

> "...'FIESTA's' greatest strength is its staff. One of the instructors was chosen by the Mississippi Science Teachers Association to be the best science teacher in Mississippi."

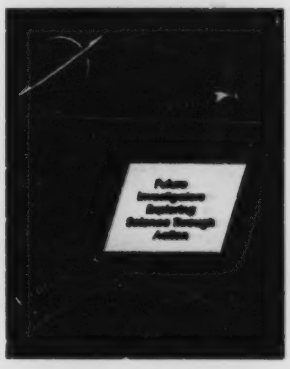
As the title implies, this Summer Science Camp main focus is on students becoming actively involved in learning sciences through their own investigations. In *Project Director Dr. William J.Sumrall's* own words: **"...It is my desire...that all 50 participants ...develop science fair projects for their school and for the Mississippi State University Regional Fair."**

The program attempts to improve the students' achievement levels in science and mathematics through intensive development of their basic scientific process skills in experimental and cooperative learning situations.

Field trips and career education activities are planned to complement the "FIESTA" Summer Science Camp curriculum. For example: Students visit the Engineering Research Center, tour Southwine Industries, and an industrial engineering laboratory.

During the academic year, participants are scheduled to meet for follow-up activities on Saturdays, to work on projects for state and local science fair competitions, and to actively participate in the special "National Science and Technology Week" held on the Mississippi State University campus.

FIESTA's Principal Investigator, Dr. William J. Sumrall, praises his staff: **"...I would like to state that 'FIESTA's' greatest strength is its staff. One of the instructors was chosen by the Mississippi Science Teachers Association to be the best science teacher in Mississippi."** •



Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Jackson State University Jackson, Mississippi	48	4 weeks	7, 8	1, 2, 4, 6, 7, 8, 9, 10
Mississippi State University, Mississippi State	50	4 weeks	7, 8	1, 2, 4, 5, 7, 8, 9

Program Activities:: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

CAMP TRIPLE E:
EXTEND - EXPLORE - EXCEL
SUMMER SCIENCE CAMP
IN ST. LOUIS MISSOURI

A grant from the **National Science Foundation** in 1994 allows the **Center for Excellence in Urban Education**, housed at the University of Missouri at St. Louis, to conduct the four-week commuter Summer Science Camp called **"Camp Triple E: Extend - Explore - Excel"** for 50 under represented 6th and 7th grade students selected from St. Louis City, Normandy, and University City schools in Missouri. Additionally, 6th, 7th, and 8th grade students from St. Louis who completed science research papers or science fair projects during the academic year are encouraged to participate as well. The selected site of the "Camp Triple E: Extend - Explore - Excel" Summer Science Camp is the "Crossroads School 800 DeBaliviere", a centrally located private school with excellent lab and classroom facilities.

Program Director Lloyd Richardson explains the "Camp Triple E" Summer Science Camp's **goals: "...Camp Triple E is designed to provide an opportunity for middle school students to participate in science investigations that utilize a cooperative approach to the scientific method in a setting other than the traditional classroom.... to encourage and increase the number of students to consider sciences or mathematics related fields as their career choice..."**

The "Camp Triple E" Summer Science Camp **curriculum** splits participants into two groups of five to six students, overseen by a leadership team of middle school science teachers, undergraduate, and high school students who all plan to pursue science as career choices, providing them with excellent learning experiences in sciences and math.

The participant groups function as "communities of learners" to investigate a chosen sciences topic for research by utilizing field trips to scientific investigation sites, and additional materials and supplies. All students receive intensive computer training and participate in introductory sessions to library research skills and the Internet. Once the group research projects are completed, the middle school students present the results to their peers and the staff in form of display poster sessions. Students of the 1995 Summer Science Camp worked on projects related to solar powered cars, and were able to participate in the "Sunrace", an annual, nationwide race of solar powered cars

"...Without a doubt... 'Camp Triple E' has awakened the sleeping giants in staff and students and has produced significant results... including the forming of a 'community of learners.' "

Camp Triple E
Extend Explore Excel

CAMP TRIPLE E:
EXTEND - EXPLORE - EXCEL
SUMMER SCIENCE CAMP
IN ST. LOUIS MISSOURI

which takes place in Alton, Illinois. Other sciences projects are related to the disciplines of chemistry, biology, economics, geology, physics, health sciences, and mathematics.

The Summer Science Camp program also schedules career exploration field trips to the University of Missouri at St. Louis and other educational institutions to familiarize the participants with these facilities and expose them to the academic programs available in college.

The "Camp Triple E" Summer Science Camp gives parents four unique opportunities to be involved in the program: They are invited to the first day orientation to gain an overview of the Summer Science Camp. One week later, they attend an "Open House" day to "shadow" their children at the the Summer Science Camp. Parents join their sons and daughters in the "Campus Event", an overnight stay at the Honors College dormitory, and join their children for a tour of the campus and informational sessions on college education and financial aid.

The Summer Science Camp program ends with the formal presentation of the results of participants' science research projects to peers, parents, and staff. One participant, Melanie Miller, was selected by her co-participants to attend the National Conference on Diversity in the Scientific and Technological Workforce in Washington, DC as a representative of the 1995 "Camp Triple E" Summer Science Camp.

Parents, participants, and staff attest to the positive outcomes of the "Camp Triple E" Summer Science Camp in the post-program evaluation. Students' interest levels in math and sciences were increased, their knowledge levels and interest in careers in these fields stimulated. The staff teachers believe that participants were able to improve their math and sciences knowledge due to the innovative group sciences investigations. "...Without a doubt," says a *Summer Science Camp staff member*, "...the four-week 'Camp Triple E' has awakened the sleeping giants in staff and students and has produced significant results ...the forming of a 'community of learners' is just one of several surprising outcomes.... It is this kind of positive attitude and high expectations that have made this Summer Science Camp a true success." •

Camp Triple E is designed to provide an opportunity for middle school students to participate in science investigations that utilize a cooperative approach to the scientific method in a setting other than the traditional classroom.

EARTH 2010 - YOUR FUTURE: POPULATION GROWTH AND ENVIRONMENTAL IMPACT IN MISSOURI

Earth 2010 - Your Future: Population Growth and Environmental Impact" is a unique multi-disciplinary Summer Science Camp at **Southwest Missouri State University** funded by the **National Science Foundation** held in the summer of 1996. Seven academic departments of the College of Natural and Applied Science are involved: Biology; Chemistry; Computer Sciences; Geography, Geology and Planning; Mathematics; Physics and Astronomy.

This residential four-week Summer Science Camp provides 50 under represented 7th and 8th grade students with the opportunity to increase their awareness and knowledge of environmental issues, and to realize how science, technology, and mathematics are related to solving environmental problems. In addition, the program provides career guidance and motivation for students to remain in school and continue the study of science and mathematics.

An unprecedented population growth in Stone, Taney, and Greene Counties in Missouri has not only depleted natural resources, but also resulted in environmental problems due to land development, waste disposal, and urban development. Hence, this area is an ideal real life setting for the study of population growth and its environmental impact, which the "Earth 2010 - Your Future: Population Growth and Environmental Impact" Summer Science Camp seeks to involve its participants in. Using water and energy as a theme for the **curriculum,** students then study the effects of population growth on natural resources and the environment. Participants learn to recognize the problem, the appropriate use of scientific methodology, and decision-making skills.

Lecture, discussion, hands-on experiential learning in the field and laboratory, and small group research are the primary tools in examining these topics, including the related social and political ramifications. Extensive instruction in the sciences, mathematics, computer use, library use, and report writing are provided by workshop staff.

An unprecedented population growth in Stone, Taney, and Greene Counties in Missouri has not only depleted natural resources, but also resulted in environmental problems due to land development, waste disposal, and urban development. Hence, this area is an ideal real life setting for the study of population growth.

BEST COPY AVAILABLE

EARTH 2010–YOUR FUTURE: POPULATION GROWTH AND ENVIRONMENTAL IMPACT IN MISSOURI

A strength of this Summer Science Camp is the multi-disciplinary staff from seven departments in the College of Natural and Applied Sciences.

Field trips to various sites provide information on population growth and how it affects water supply, energy, and habitat loss. These places include the Springfield Conservation Nature Center and the City Utilities Water Treatment Plant.

Several businesses and gubernatorial agencies in the area are cooperating with Southwest Missouri State University on this project by making their facilities available for tours. Scientists from these organizations give presentations, provide career guidance, and mentoring services to the students.

The participants' individual research projects will be carried on into the academic year follow-up program under the guidance of their respective home school teachers.

After completion of the "Earth 2010 - Your Future: Population Growth and Environmental Impact" Summer Science Camp, students are expected to have gained enough science and mathematics knowledge and experience to successfully continue their education, consider careers in the field of sciences and math, and become active members of the community in environmental issues. •

Using water and energy as a theme for the curriculum, students study the effects of population growth on natural resources and the environment. Participants learn to recognize the problem, the appropriate use of scientific methodology, and decision-making skills.

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
University of Missouri at St. Louis, Missouri	50	4 weeks	6, 7	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Southwest Missouri State University, Springfield, Missouri	50	4 weeks	7, 8	1, 2, 3, 4, 5, 7, 8, 9

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

SCIENCE, ENGINEERING, MATHEMATICS EXPERIENCE (SEME) IN NEBRASKA

The Office of Multi-Cultural Affairs and the College of Engineering at the **University of Nebraska at Lincoln** (UNL) received funding from the **National Science Foundation** in 1994 to conduct for the next three years a six-week residential Summer Science Camp program called **"Science, Engineering, and Mathematics Experience" (SEME)** serving 44 disadvantaged 8th and 9th grade students selected from five Lincoln public middle level and junior high schools.

The SEME is developed out of concern that young under represented students are not selecting careers in mathematics, sciences, and engineering. Hence, the "Science, Engineering, and Mathematics Experience" Summer Science Camp program seeks to expose young students to these disciplines via participation in modules, where learning occurs by means of lectures, reading assignments, hands-on and testing activities in laboratories.

The SEME **curriculum** is built in six teaching modules: Biology, Chemistry/ Chemical Engineering, Computer Sciences/Electrical Engineering, Physics/ Material Engineering, Mathematics/Statistics, and Mechanical/Civil Engineering.

Each week of the program focuses on one of the above six science, engineering or mathematics modules. Learning activities comprise classroom instruction, laboratory experiments, weekly **field trips** to scientific investigation sites, where new concepts can be demonstrated. Moreover, structured career exploration activities are woven into the six-week program, assisting participants to begin thinking about planning their long range academic and career goals.

All modules are led by a **staff** of University of Nebraska at Lincoln faculty and certified teachers from the Lincoln Public School System with the intention of increasing students' awareness levels of the distinctions among the various types of engineering careers. In addition, the students are engaged in individual research projects, meet professional scientists as guest speakers who provide valuable career information, and venture on a large number of sciences and math related field trips. Interestingly, the "Science, Engineering, and Mathematics Experience" Summer Science Camp participants join the **Upward Bound Program**

"Students and parents both indicated resounding approval and affirmed that the 'Science, Engineering, and Math Experience' has widened students' horizons in life changing ways."

University of Nebraska Lincoln

Students develop analytical thinking skills in weekly chess classes.

"SEME" participants take notes during a mathematics class.

attendants to visit eight universities in three different states during the course of the Summer Science Camp.

After completion of the summer program, students are graduated at a special banquet and awards ceremony to which friends and families are invited.

Two significant long term partnerships have been formed by the Office of Multi-Cultural Affairs' "Science, Engineering, and Mathematics Experience" program and the University of Nebraska at Lincoln: 1) A Howard Hughes Biological Science Grant ($ 15,000) was awarded to the "Science, Engineering, and Mathematics Experience" Summer Science Camp to attract under represented students to the study of biological sciences. 2) A University of Nebraska "Experimental Programs to Stimulate Competitive Research" grant of $20,000 was awarded to allow its Office of Multi-Cultural Affairs and Department of Biological Sciences to attract under represented students to careers in biological sciences.

The **academic year follow-up component** of the "Science, Engineering, and Mathematics Experience" Summer Science Camp is designed to make numerous precollege programs and resources available to the participants in order to promote their continued academic success.

The post-program evaluation report of *Program Director Dr. Jimmi Smith's* "SEME" Summer Science Camp concludes: **"...The 'Science, Engineering, and Math Experience' program is well run, cost effective, and an asset to participants, parents, the University of Nebraska at Lincoln, and the community at large...Students and parents both indicated resounding approval and affirmed that the 'Science, Engineering, and Math Experience' has widened students' horizons in life changing ways."**

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
University of Nebraska at Lincoln, Nebraska	44	6 weeks	7, 8	1, 2, 3, 4, 5, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SCIENCE IN THE CITY-
PARENT ADOLESCENT COLLABORATION FOR EDUCATION (PACE)
SUMMER SCIENCE CAMP IN NEW JERSEY

The PACE program already in place is now in its seventh year of operation at **Rutgers University**. The program is a key part in Rutgers' mission as an urban university to reverse the under representation of certain population groups in the field of sciences, engineering, and mathematics.

Program Director Dr. Lambert Jackson explains the university's approach: **"...Historically, many students have chosen engineering as a profession as a direct result of information obtained from a relative in technical, engineering, or scientific fields. For most urban students this connection does not exist. We believe that introducing students to engineering at a relatively early age, and sustaining and encouraging that interest over a period of years is the key to closing the information gap regarding engineering, technology, and science among these students."**

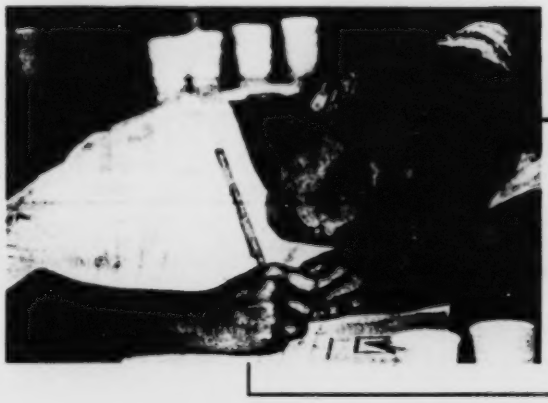
In the PACE program, students who have completed the 7th grade participate in a four week summer program, called PACE I, structured around electronics and computer laboratory work. They also return during the school year for additional sessions. PACE II provides 8th graders with the opportunity to participate in a four week intensive program focusing on scientific research methodology and computer programming.

Building on PACE I and II, the **National Science Foundation** started to fund a third component in 1994: the **Parent Adolescent Collaboration for Education (PACE) III**, a Summer Science Camp Program called **"Science in the City"**, which selects 45 promising 9th grade under represented students from Camden City schools for participation in its four-week commuter summer program.

"...PACE III adds a third component to the other PACE I and II programs. It focuses on the theme of science in the city. Students in this program carry out projects that show how methods and tools of science can be used to understand and shape life in the urban setting," says *Program Director Dr. Lambert Jackson.*

In the first week, students learn the basic skills of collecting and analyzing data, and how to use computers as

Using their own city as an example, students are able to see how science can not only be a career choice, but that it is an exciting avenue to make some real changes for the future of their families and mankind.



A moment of intense study for a young participant.

"Parent Adolescent Collaboration III" introduces these young students to the intricate work of programming pictures with an oscilloscope in the microelectronics laboratory.

tools for data analysis and communication. Students who are new to the program are paired with former PACE participants. Once the students have acquired these basic skills, each of the four weeks of PACE III focuses on a different aspect of life in the city. The PACE III **curriculum** offers learning experiences in four content areas. The first week focuses on cognitive skills, the second week on chemical analysis, the third week on biology, and the fourth week on civil engineering. Woven throughout the entire four-week program is a course in urban structure and contemporary urban problems with a focus on environmental issues. Particular attention is given to the study of trace elements in urban environments, understanding river biology and rivers as a water source and habitat for animal and plant life, and the investigation of sewage and waste disposal in urban environments.

The program provides practical exposure to and hands-on experience in scientific disciplines through the study of existing facilities that provide urban services. Experiments and lectures are conducted around how these operations work, and their importance to urban development.

The Summer Science **staff** consists of college science and social science faculty, along with high school teachers. College students assist the faculty as laboratory assistants and student mentors for the participants.

Career Counseling sessions and workshops for **parents** on how to support their children's academic success are integrated into the curriculum. Parents are required to be involved in the program, and they are encouraged to attend all events.

Career exploration is additionally provided through **field trip** sites chosen for their representation of potential careers related to the sciences covered by the Summer Science Camp curriculum. They included in previous years a trash-to-steam plant, the municipal utilities authority, and local engineering firms.

THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS
Campus at Camden

Program Director Dr. Jackson believes that **"...what makes this program unique is that it ties science and scientific careers into the everyday lives and environment of the students. Using their own city as an example, they are able to see how science can not only be a career choice, but that it is an exciting avenue to make some real changes for the future of their families and mankind."**

Follow-up activities during the academic year include further career counseling and laboratory workshops.

Parent Patricia E. Braxton describes the positive changes she saw in her son after participating in the PACE III program: **"...Ronald first entered the PACE III program as preteen who did just enough in school to get by. His career goal was to become a football star.... After the summer phase of the PACE III program, he became less certain about his previous career choice ...His self-image was changing, his confidence in himself growing ...During the new school year, Ronald enthusiastically awaited the PACE meetings, whether they were counseling or lab sessions. He always encouraged me to attend the meetings as well. At the end of the second summer session, Ronald shared with me that he is considering becoming an electrical engineer, and that he plans to attend Rutgers University after completing high school. ... I am deeply indebted to the PACE III Summer Science Camp program and its dedicated staff for their continued efforts on behalf of parents and children."** •

BEST COPY AVAILABLE

"FANTASTIC VOYAGE"
SUMMER SCIENCE CAMP IN NEW JERSEY

With funding from the **National Science Foundation**, the **New Jersey Medical School in Newark** has taken 40 promising under represented 9th grade students on a five-week **"Fantastic Voyage"** commuter Summer Science Camp since 1994. *Program Director Dr. Ophelia Gona* describes how she came up with the program's design: **"...The idea came from a science fiction movie based on a book written by Isaac Asimov. Participants read chapters of the book and then work on the science activities and math problems derived from it. The 'Fantastic Voyage' is about a group of people being reduced to microscopic size who board a miniature submarine and are injected into a dying man. In order to save him, they have to reach a blood clot and destroy it with a laser gun."**

"Fantastic Voyage" participants dissect a beef heart in a biology activity in the science laboratory.

The participants begin each day by reading a chapter from the novel, "The Fantastic Voyage." Science activities are derived from on chapter titles, and mathematics problems are related to the science activities of the day.

The New Jersey Medical School Summer Science Camp enables students to explore math and science concepts in a **curriculum** focusing on biological and medical science problems. It applies scientific methodologies, problem solving and communication skills to specific scientific problems, all under the guidance of the Summer Science Camp faculty. The program's **goal** is to broaden participants' knowledge base in sciences enough to encourage them to pursue further study in these fields, ultimately instilling in them the idea of a college degree as desirable and achievable.

The "Fantastic Voyage" Summer Science Camp encourages the participants' problem identification and problem solving skills. Consequently, activities are designed to encourage them to take on more than a hands-on role in the summer program; total involvement in the program is the goal.

Students and teachers gain first hand knowledge on garbage burning during a visit to an investigation site.

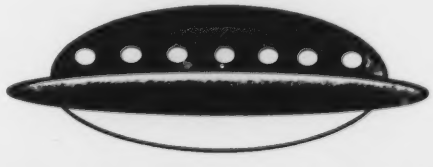
The participants begin each day by reading a chapter from the novel "The Fantastic Voyage". Science activities are derived from chapter titles, and mathematics problems are related to the science activities of the day. Students work in teams of six with high school and elementary teachers, counselors, college faculty and college students - all from under represented groups of the general population- acting as facilitators and role models for the participants. Initially, the students were reluctant to begin scientific discussions and worked in isolation. By the end of the Summer Science Camp, all students eagerly participated in offering suggestions to perform tasks and approached problems as a team!

Frequent off-campus science activities, such as **field trips** to the Submarine U.S.S. Growler, the New York City Office of the U.S. Drug Enforcement Agency, the Liberty Science Center, and the Pocono Environmental Education Center, and guest speakers provide the students during the summer program with math and science career exploration opportunities.

"Fantastic Voyage" participants are monitored in school with **academic year follow-up activities** which include special science days during the school year. **Parents** are active home partners during the summer and academic year program, who are encouraged to visit the site and to come along on field trips.

Parent Joyce Lee, after describing the positive impact of the program on her son, adds: **"...I believe we would find a lot more minorities in the science fields if schools would introduce science to students the way you have.... It appears urban schools do not have the resources necessary to make science more appealing. Programs of this type are the only way many kids like my son will have an opportunity to gain exposure to the many facets of science. I hope that other...students will have an opportunity to share in such an experience. It was a program of this type that helped steer my daughter towards a science career and an internship in a medical research laboratory."**

An important and unexpected outcome as a result of the success of the National Science Foundation funded "Fantastic Voyage" Summer Science Camp at the community and University level is the selection of the *New Jersey Medical School as the winner of the 1994 Outstanding Community Service Award, given by the Association of American Medical Colleges.* •



FANTASTIC VOYAGE
Summer Science Camp

NEW JERSEY INSTITUTE OF TECHNOLOGY
SUMMER SCIENCE CAMP

"**Marine Science**" is the curriculum focus of a four-week commuter Summer Science Camp jointly funded by the **New Jersey Institute of Technology** and the **National Science Foundation** from 1992 to 1995. A total of 47 disadvantaged students from 7th, 8th, and 9th grade selected from their local Newark public schools are invited to participate in the "New Jersey Institute of Technology Summer Science Camp".

The four-week academic **curriculum** components are math, computer science, sciences with a special emphasis on marine science, environmental science and chemistry, and units on oral and written communication skills. These components are enhanced by two **field trips,** which for 7th graders included a three-day stay at the Pocono Environmental Education Center and a trip to Sandy Hook. The trips are related to marine science and designed to reinforce the class activities.

The sciences activities focus on chemistry, especially the study of the effects of density in relation to temperature, the structure of an atom, and chemistry research investigation. Physics activities center on the study of electricity and magnetism. At the end of each science lab session students are required to write a lab report. In the mathematics classes fractions, decimals, area, graph reading, and word problem exercises are taught every day in a hands-on approach. Computer classes include both, word processing and LOGO.

A **staff** of undergraduate student tutors, graduate student assistants and counselors teach and coordinate the instructional and recreational activities of the "New Jersey Institute of Technology Summer Science Camp".

Academic, financial, and career counseling sessions are provided to program participants, exposing them to formal and informal interaction with professors, graduate, and undergraduate students from different ethnic groups who are engaged in science-based careers.

The Summer Science Camp has strong linkages with the following community-based partners: "Protestant Center, Inc.", the "One to One" mentoring program, and the "Pre-College Elementary Science Outreach Program".

Parents are strongly involved as guardians from the beginning to the end the program. "College Preparation, Raising Teenagers, and Study Skills Development" are special workshops offered to them for the duration of the "New Jersey Institute of Technology Summer Science Camp".

Academic year follow-up activities on Saturdays led to high retention of students and parents via mathematics hands-on activities and special precollege workshops for parents.

NJIT
New Jersey Institute of Technology

Team building exercise during a field trip to the Pocono Mountains for participants of the 1995 program.

Academic year follow-up session on a Saturday allows participants to be engaged in exciting hands-on science learning experiences.

Follow-up activities during the academic year enrich the regular school curriculum with a variety of hands-on math and science learning experiences. In the "Saturday Program" additional academic, mathematics and sciences career counseling sessions, along with the monitoring of participants' academic success help to maintain high levels of student retention and parental involvement. The 9th grade participants take Algebra 1 and enroll in the **"Upward Bound Program"**, a precollege program, showing the positive impact the "New Jersey Institute of Technology Summer Science Camp" has on the students' academic goals. The academic year follow-up activities also allow parents and students to meet and talk with science and math professionals, who come to share information about their work responsibilities.

Participants show an increase of interest levels regarding science and math, and careers in science, engineering and mathematics. Their improved science knowledge leads, in general, to better post-test results. Unfortunately, the lack of change in educational strategies at the public school level, and limited financial possibilities inhibit the desired improvement of participants' school grades and attitudes towards school and education.

Program Director Dr. Howard Kimmel highlights the unfavorable impact of the "New Jersey Institute of Technology Summer Science Camp's" shortage of funding: **"...The shortage of money had a number of consequences. Basically, the children felt that they were getting short shrift, mainly manifested in fewer and less exciting trips.... Our main strategy was to have the Summer Science Camp participants included in trips which other similar aged groups were going on."** •

BEST COPY AVAILABLE

CHOICE ALLIANCE FOR MINORITY PARTICIPATION - PROGRAM FOR MINORITIES IN SCIENCE AND ENGINEERING (CAMP PROMISE) IN NEW JERSEY

Rutgers University's Cook College in New Jersey received funding from the **National Science Foundation** to conduct its first residential four-week Summer Science Camp in 1995, called **"Camp Promise"**, serving under represented students selected from 8th and 9th grade in Trenton, Princeton, and New Brunswick Public Schools according to students' self appraisals, and evaluations by parents and teachers.

Prior to the implementation of the Summer Science Camp, Cook College faculty, personnel from the school districts, members of the "Environmentor Project", "Corner House of Princeton", and "Johnson & Johnson Pharmaceuticals" were involved in extensive planning sessions, recruitment and selection of participants, and the curriculum design of the "Camp Promise" Summer Science Camp. *Dr. Penelope E. Lattimer, Assistant Superintendent, Curriculum and Instruction, with the New Brunswick Public Schools* vouches: **"...I am writing to indicate our willingness to cooperatively engage in the project: 'Camp Promise'.... There is no doubt that this project will enrich the lifestyles of our young students and it will develop their ability to improve their decision-making skills..."**

Cook College Assistant Dean A. Patricia Johnson states the program's **goal: "...provide hands-on scientific experiences along with career exploration and ...role models to prepare and motivate participants to enter science and engineering fields of study..."**

The "Camp Promise" **curriculum** focuses on developing its middle school participants' basic skills in the fields of sciences, mathematics, writing and study habits. An expanded computer skills development program and mini-courses in biology, chemistry, and physics complemented the basic skills development component.

"There is no doubt that this project will enrich the lifestyles of our young students and it will develop their ability to improve their decision-making skills."

Students are divided into three heterogeneous groups for participation in learning activities and mini-apprenticeships in biology, chemistry, and physics, as well as study sessions in computer technology, study skills, research/debate, mathematics, and writing. Recreational activities, tutoring, mentoring, and computer sessions are a daily part of the program.

Summer Science Camp participants are invited to a special tour and presentations at AgBiotech laboratories, a center for agricultural molecular biology. "Grow Your Own Genes" is the title of a workshop planned and conducted by AgBiotech staff, which focuses on the importance of plants in the

The "Camp Promise" curriculum focuses on the fields of sciences, mathematics, writing and study habits. An expanded co..puter skills development program and mini-courses in biology, chemistry, and physics complement the basic skills development component.

students' diets, sketches the history of crop cultivation and improvement, and introduces the students to suggestions on how modern methods can achieve similar and new goals; the important connections between laboratory experiments and real world concerns of farmers, food processors, and consumers are stressed as well. Participants engage in a simplified experiment that demonstrates genetic transformation by creating tumors on plants. The middle school students take their infected host plants home to observe the results in one to two weeks. The AgBiotech staff encourages the workshop participants to think about future career possibilities in the molecular biology-related field.

Special activities during the "Camp Promise" Summer Science Camp include guest speakers on development of self-esteem, cultural activities of African Dance, and an "Academic Bowl". The semi-final and final competitions in this "Academic Bowl" science fair activity occur as an evening program with the participants' families as the audience.

"Camp Promise" participants have the opportunity to continue their sciences and mathematics education after the Summer Science Camp experience by participating in the successful **"Discovery"** and **"Upward Bound"** programs already in place at Rutgers University.

Stephen Roman, Science Coordinator at Rutgers University's Center for Mathematics, Science, and Computer Education (CMSCE) states: **"...CMSCE is eager to become involved in educational initiatives which seek to improve the quality of instruction in mathematics, science, and computers...Your proposal to the National Science Foundation ...represents a unique opportunity...I am confident that our previous collaboration...will be an asset as we set out to implement your proposal at the middle school level..."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Rutgers University, Camden, New Jersey	45	4 weeks	9	1, 2, 3, 4, 6, 7, 8, 9, 10
UMDNJ – New Jersey Medical School, Newark, New Jersey	45	5 weeks	9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
New Jersey Institute of Technology, Newark, New Jersey	50	4 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Rutgers University & Cook College, New Brunswick, New Jersey	50	4 weeks	8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

WATER ECOLOGY PROGRAM SUMMER SCIENCE CAMP IN NEW MEXICO

"The New Mexico Museum of Natural History and Science seeks to improve the science literacy of Native American middle school students through its successful 'Water Ecology Program", says *Program Director Susan McGuire.*

The **New Mexico Museum of Natural History's** Water Ecology Research Project has operated since 1990. It had been funded by a seed grant initially, and has received financial support in subsequent years from the U.S.D.A., the Forest Service, the U.S. Fish and Wildlife Service, along with other federal and state organizations.

In 1993, the **"Water Ecology Program"** received a grant from the **National Science Foundation** for a Summer Science Camp serving 50 students selected primarily according to teacher recommendations, and a student essay on their interest in the program. Students' math and science grades are considered as well.

Four separate Indian tribes in New Mexico are served by the program and host it: Cochiti Pueblo, the Jicarilla Indian Reservation, Isleta Pueblo, and the Mescalero Indian Reservation.

"...This program takes Native American youngsters and exposes them to hands-on activities to give them a more realistic understanding of science careers...partnerships have been formed between the Museum, governmental agencies, and educational institutions ...to provide middle school students with a broad exposure to science-based careers in New Mexico," says *Program Director Susan McGuire.*

The **curricular focus** of the program is on water ecology and riparian biological diversity. A unique characteristic of this "Water Ecology Program" Summer Science Camp is the fact that its curriculum can be customized to the respective participants' communities. This customization is accomplished with input from community leaders and teachers, who are involved in the project and understand crucial local water related issues.

Instructional activities connect the students in an active, long-term collection of data regarding water quality on the Rio Grande and some of its tributaries. Students take water samples at three locations in their respective communities. Each location is water-sampled twice, with at least three days in between the samplings. Water samples are tested according to the following water quality parameters: dissolved oxygen, carbon dioxide levels, hardness, nitrates, phosphates, pH, temperature, and suspended solids. They also rate the stream's physical characteristics at the location, and collect data on its biodiversity. In order to measure up to the testing regime, students are trained in classrooms in the correct use of equipment, identification of plants and animals, and determination of stream order. Participants also conduct an in-class experiment on the effects of fertilizers on the growth of algae in a closed

The "Water Ecology Program" introduces participants to the tasks and work of a scientist familiarizing them with sciences activities like identifying aquatic organisms using field microscopes.

system. They learn to present the collected data in graphs for future reference and analysis of field experiments, creating an excellent illustration of the effects of nitrates and phosphates on freshwater systems.

Isleta Pueblo visit the Bosque del Apache, and the Rio Grande Nature Center. Guest speakers like the Tribal Governor visit the program to share their knowledge on environmental issues and of career opportunities.

At the end of the Summer Science Camp program, participants from the four Native American communities

The customization of the program to the respective participants' communities and water conditions in these geographic areas provides the students with relevant and meaningful information.

Program Director Susan McGuire elaborates on the Summer Science Camp's curricular content focus: **"...Using water quality monitoring as a theme unifies all of the student activities...Water quality, water conservation, and the ecology of riparian areas are of great concern to the arid southwestern United States. This theme has also been chosen to facilitate the involvement of whole families and rural communities in the program. The community and family support produced through the choice of this theme is intended to reinforce the shifts in student attitudes towards science..."**

A variety of **field trips** complement the hands-on classroom and outdoor learning experiences. Participants from present their project results at the closing ceremony's "Student Congress". Here, students from each site present their data to **parents**, teachers, community leaders, and the participants from the other investigation sites. This allows participants to present their research to and to interact with a larger audience.

The final external program evaluation report concludes with the significant statement:

✔ Participants in the 'Water Ecology Program', their parents, and community members think highly of the program.

✔ Participants are enthusiastic about the field trips and carrying out real experiments.

✔ The customization of the program to the respective participants' communities and water conditions in these geographic areas provides the students with relevant and meaningful information.

✔ *Parents* from the Mescalero and Jicarilla Indian Reservations suggested that the "Water Ecology Program" **"should run longer"** and **"allow more children to participate next year."**

Written responses to the post-program evaluation questionnaires show a slight increase in the Native American participants' interest levels in learning science. The most positive change in attitude was measured in interest in experimentation. Interest in scientific careers increased slightly, too. Some of the participants expressed stronger interests in pursuing advanced high school courses in science and math.

The selection of one "Water Ecology Program" participant to present the project's research results at the National Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C. in 1995 underlines once more the very significant positive impact the Summer Science Camp had on these young students. •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
New Mexico Museum of Natural History & Science, Albuquerque, New Mexico	50	3 weeks	6, 7, 8	1, 2, 4, 5, 7, 8, 9

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

TERRA: AN ENVIRONMENTAL SUMMER SCIENCE CAMP IN NEW YORK CITY

Eugenio Maria de Hostos College in New York City held an environmentally oriented Summer Science Camp funded by the **National Science Foundation** called: **"TERRA: An Environmental Summer Science Camp"** from 1992 to 1995.

"...Utilizing New York City's natural resources and its professional scientists, engineers and mathematicians, the Center for Pre-College Initiatives at Hostos Community College has joined forces with the National Science Foundation, local high schools, universities, community based organizations ...and ...businesses to form an innovative educational ...Summer Science Camp program," says *Program Director Awilda Orta.*

During the six-week camp, 50 under represented students in 8th and 9th grade are involved in inquiry-based scientific projects, and learn about careers in science, engineering and mathematics.

The "TERRA: An Environmental Summer Science Camp" **curriculum** focuses on English, computer science, mathematics, engineering, medical science, marine biology and ecology in structured classes and hands-on laboratory activities.

In accordance with the Summer Science Camp's environmental focus, the three major sciences projects the students work on are in the fields of Agriculture, Urban Design, and Marine Science. All of these science projects are very closely connected with the participants' daily lives and environment.

Program activities are scheduled as follows: The students participate in academic enrichment classes in mathematics, sciences, and computers on Monday, Tuesday, and Wednesday mornings. They receive tutoring, participate in career awareness workshops and recreational opportunities on Thursdays. The mini-laboratory science programs are held Monday through Wednesday afternoons. They include:

1) The design and construction of a hydroponics laboratory under the supervision of a faculty member from Cornell University Cooperative

A "TERRA" participant at work in the engineering laboratory for her marine sciences project.

Participants select one of three science-based activities:
a) Design and construction of a hydroponics laboratory to conduct plant experiments;
b) Assess and design vacant lots in a neighborhood for recreational and cultural needs of the community;
c) Nautical knowledge on reading blueprints.

Extension. Students learn about environmental and agricultural sciences by conducting plant experiments in a controlled liquid environment. Physics, chemistry, horticulture, water quality control, and plant science are taught.

2) Students participate in an environmental urban design course. They speak with community residents about potential uses of vacant lots in the neighborhood, and conduct an assessment of the area's recreational and cultural needs. They learn about costs that would be incurred in the design and construction of community spaces, and the relationship regarding community ecology. In addition, participants learn about the special social issues that might arise if their designs were implemented. Students sketch and produce models of a variety of designs for community spaces. Architecture and design elements are included within this study module, with emphasis on community needs and maintaining the environmental integrity of the neighborhood.

3) Students participate in a pre-engineering and marine science course that provides them with a unique experimental approach to the practical application of engineering, mathematics, nautical technology, marine ecology, and water resources held at Dyckman Marine in Manhattan. Students in this project gain experience and knowledge through hands-on activities in reading blue-prints, beginning the construction of a 14-foot sail boat from a full-size pattern, and developing skills in lofting.

All students are taken on educational **field trips** that are related to their chosen enrichment courses. For example, maritime students visit the Norwalk Maritime Center, while hydroponics students visit the Urban Park Rangers at Orchard Beach and take a tour of the New York City's Interior Gardens.

Career awareness workshops are provided by the staff of the Hostos Development Division. Outside speakers from medical, architecture, and science professions present lectures to the Summer Science Camp participants.

Parents are invited to an "Open House Day", where they participate in the various activities and are provided with career awareness information in sciences and mathematics.

High attendance, an increased interest in math and science, as well as an improvement of science skills, underline the program's success. •

WILDLIFE INQUIRY THROUGH ZOO EDUCATION (WIZE) SCIENCE ADVENTURE IN NEW YORK CITY

The **Bronx Zoo** has been awarded funding from the **National Science Foundation** to develop the 1996 Summer Science Camp program for the **"WIZE Science Adventure"**, which is based on Wildlife Inquiry through Zoo Education (WIZE), an award-winning secondary science curriculum also developed in collaboration with the Bronx Zoo and the National Science Foundation.

The newly funded Summer Science Camp serves 35 economically disadvantaged and academically under-served students selected from 8th grade in New York City schools in districts 9, 10, and 11 in the Bronx and district 6 in Manhattan. This four-week commuter program is designed to promote a lasting interest in science and mathematics in its participants, encouraging them to value and continue their science, math, or technology education. The Summer Science Camp also attempts to instill an understanding of issues involving the environment, habitats, and wildlife preservation.

The program site is the world-famous Bronx Zoo. Here, students explore wildlife adaptations to habitats around the world, wildlife biology issues, exhibit design, animal survival strategies, population dynamics, and community ecology. Small group projects involve hands-on activities and problem solving skills.

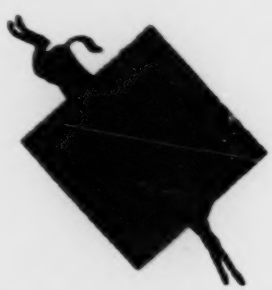
Participants meet keepers, curators, animal health specialists, and horticulturists, who introduce them to their work. The students use video equipment, cameras, and scientific equipment that biologists use in the field to collect and analyze data. The most exciting simulation activity is that of students assuming the roles of wildlife reserve and zoo managers, making difficult decisions regarding the future of their acquisitions.

A **field trip** to the Aquarium is scheduled to further investigate wildlife conservation.

During the **academic year follow-up** phase of the program, students attend three day-long seminars. At two of these seminars they have further contact with professionals in the sciences like nutritionists, pathologists, research biologists, and geneticists, who explain their responsibilities and projects. Academic training for wildlife related careers is discussed with these scientists and other zoo staff. The third follow-up seminar focuses in a workshop setting on endangered species. This session serves as an ideal springboard for school projects. Mentors assist students developing projects for science fairs and presentations.

Parents are kept informed about their children's progress in the program, and are invited to attend the special graduation ceremony. •

The Bronx Zoo "WIZE" program is an award-winning secondary science curriculum developed by the Zoo with National Science Foundation support. Now, the "WIZE" program, funded by the National Science Foundation, serves middle school students at the Bronx Zoo!



COMMUNITY SCHOOL DISTRICT #23 SUMMER SCIENCE CAMP IN BROOKLYN, NEW YORK

In 1995 the **National Science Foundation** has granted funds to the **Community School District #23 in Brooklyn, New York** to offer for the first time a six-week commuter Summer Science Camp for 75 under represented 7th through 9th grade students selected from Junior High School 263 and the school PS/IS 284.

The Summer Science Camp seeks to stimulate an interest in mathematics, science, and engineering in the participating under represented middle school students to prepare them for enrollment in high school courses in these fields, and to reduce the school drop-out rate. Participants are encouraged to consider science, engineering, mathematics and technology as possible career choices by exposing them to scientists and engineers who serve as role models.

This Summer Science Camp **curriculum** is designed to be an interdisciplinary, enriching math, sciences, and technology multimedia program with a focus on environmental sciences and the application of mathematics to environmental problems. Classroom instruction is linked with outdoor science activities such as weather measurements and water purification. Students learn about urban design and ecology, study park environments in New York City and plant evolution at the New York Botanical Gardens. Other **field trips** take the attendants to the Liberty Science Center, the New York Aquarium and a farm, where they analyze animal adaptations and behavior. Participants are working closely together with scientists from the respective fields as mentors in the workplace.

The Community School District #23 secured the collaboration of the Wildlife Conservation Society, the New York Zoological Society, and the Brooklyn Center for Urban Environment for implementing its first program in the summer of 1996.

Child-centered classroom activities, school and community involvement, **parents as partners**, and interaction with professional scientists, mathematicians, and environmental engineers make up this Summer Science Camp's program.

The outstanding math and sciences career awareness component of the Summer Science Camp has been carefully designed by the program staff. *Program Director Winston Smith* explains: **"...The career awareness activities are very captivating.... Students learn by 'doing' science, rather than by reading about it."**

The "Community School District #23 Summer Science Camp" intends to demonstrate to different school communities that its comprehensive mathematics, sciences, and engineering educational program can encourage under represented students to pursue courses in these fields in high schools and colleges, and eventually helps to fulfill the national education goal. •

The Community School District #23 in Brooklyn, New York, the Wildlife Conservation Society, the Brooklyn Center for the Urban Environment, and the New York Zoological Society join as a team to conduct a Summer Science Camp to increase students' interest in and exposure to science and mathematics.

SCIENCE SKILLS CENTER, INC.
SUMMER SCIENCE INSTITUTE
IN NEW YORK

Funding from the **National Science Foundation** allowed the **Science Skills Center's Summer Science Institute** to expose 125 students to four major sciences modules at four different sites in 1993: Biology/Medicine, Computer Engineering, Environmental Chemistry, and General Sciences. By the year 1994, the commuter program was able to serve 150 students, in grades K through 10, in a multi-disciplinary curriculum focusing on the disciplines of intermediate and advanced comparative anatomy, beginning biology, engineering techniques, applied technology, and chemical engineering.

The goal is to increase the participants' science knowledge and techniques, and to boost their academic and occupational awareness in the sciences, mathematics, engineering, and technology through enjoyable, interesting, and non-threatening teaching modules.

The "Science Skills Center Summer Science Institute's" **goal** since the beginning has been to increase the participants' science knowledge and techniques, and to boost their academic and occupational awareness in the sciences, mathematics, engineering, and technology through enjoyable, interesting, and non-threatening teaching modules.

The four teaching **curriculum** modules in the "Science Skills Center Summer Science Institute" program make excellent use of the vast resources in the fields of sciences and technology available in Brooklyn and New York City. The "Building Access to Science Enrichment - Medicine" module provides 25 participants with the outstanding opportunity to attend lectures and lab sessions, conducted by doctors and staff, on the site of Brooklyn's only medical teaching facility: State University of New York Health Science Center at Brooklyn. Sharing the same educational environment as medical students, the Summer Science program participants take classes on such topics as genetics, gross anatomy, doctor-patient interviewing, infectious diseases, pediatrics, ophthalmology, renal, breast health, anesthesiology, and hypertension. Participants use the Health Center's Research Library for their individual science projects.

The "Building Access to Science Enrichment - Engineering" module allows 25 participants to be enrolled in classes taught by IBM engineers at the IBM Brooklyn Plant. The students are expected to wear the same business attire as the 'real' IBM employees: shirts and ties for the boys; blouses,

BEST COPY AVAILABLE

skirts, or dresses for the girls. This engineering module exposes students to computer engineering in an actual manufacturing environment. Quality control, product planning, and integrated scheduling among IBM facilities are some of the issues that are discussed, along with an introduction to principles of electrical and mechanical engineering. The entire IBM staff, from the plant manager to the receptionists are favorably impressed with the group of students. The 6th and 7th grade students who participate in this Summer Science module pass the 9th grade Sequential I Math Regents at the conclusion of the Science Skills Center "Afterschool Program".

Participants in the "Urban Environment/Environmental Chemistry" module benefit from utilizing Pratt Institute's open landscape campus for environmental testing activities of air, soil, and water. Here, students can investigate the existence, identification, and impact of chemicals on the environment in a practical, hands-on approach outside the classroom. Twenty-five elementary and middle school students collect air, soil, and water samples, integrating the chemistry knowledge previously obtained in classroom lectures.

The "General Sciences" module is designed to introduce 50 participants to a cross section of science subjects: Physical Science, Pre-Biology, Dissecting, and Basic Engineering. The curriculum emphasizes the joy and excitement connected with science learning in a non-traditional setting.

The 25 participants enrolled in the engineering module were expected to wear the same business attire as the "real" IBM employees when taking classes at the IBM Brooklyn plant. Twenty-five students have the opportunity to attend classes on genetics, doctor-patient interviewing, anesthesiology, and hypertension at the State University of New York Health Science Center in Brooklyn.

The Science Skills Center, Inc. continuously improves its successful Summer Science Institute. The "General Science" module was extended to five subjects: comparative anatomy; math/engineering connection; math/science connection; microscopy and urban environmentalism. Two hundred students are able to participate in this module at a local school.

A new "Building Access to Science Enrichment" program started at New York City Technical College. Here, 38 students are enrolled in the design and building of a model-size radio-operated car. Computer assisted design and manufacturing, physics and robotics are the classroom lab projects taught by New York City Technical College and Science Skills Center, Inc. instructors.

"Science in Industry" is a program developed with the Brooklyn Union Gas Corporation, the largest corporation in Brooklyn. Brooklyn Union Gas Corporation management and the Science Skills Center, Inc. staff developed a curriculum focusing on chemical engineering with the goal to increase the students' knowledge of the practical engineering application of science and math theories in the use of natural gas as a fuel source. Participants further gain insight into the corporate structure and philosophy of a leading business corporation.

The Science Skills Center, Inc. Program Director Dennis Brown notified the National Science Foundation: **"...The Science Skills Center, Inc. is proud to report that our third Annual Summer Science Camp's endeavor to increase the academic and occupational awareness of our students in science, mathematics, engineering, and technology has achieved tremendous results...Our 'Building Access to Science Enrichment Program' in chemical engineering, hosted by Brooklyn Union Gas Corporation, was highlighted in an article by The City Sun newspaper. We were also quite pleased to be featured at Southern Queens Park Association and WWRL Radio's Fifth Annual Family Festival."** •

BEST COPY AVAILABLE

PATHWAYS OF MATH & SCIENCE IN NEW YORK STATE

The **State University of New York College at Fredonia** and the **National Science Foundation** have sponsored an annual commuter Summer Science Camp called **"Pathways of Math & Science"** from 1992 to 1995, and renewed the program's funding for the summer of 1996. "Pathways of Math & Science" serves 50 under represented 7th, 8th and 9th grade students selected from three local target schools in rural Chautauqua County in New York State, providing students with unique learning experiences in math and sciences and encouraging them to continue the study of math and science, to realize the importance of these subjects, and to appreciate them in their everyday lives.

Three modules make up the curriculum of "Pathways of Math & Science": I) Knowing the Course Work, designed to generate participants' academic skills and motivation, enabling them to succeed in the areas of mathematics and sciences. II) Knowing Yourself, designed to generate the students' self-development, and addresses sociocultural influences affecting under represented students' interest in math and sciences. III) Knowing the School System, designed to generate the adequate adjustment skills and information on how the high school system operates to ease the students' transition from middle school to high school.

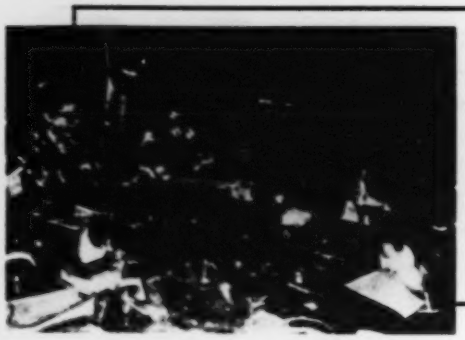
The mathematics content focuses on geometry, measurement, statistics, probability, ratio and proportion. The content focus in the sciences is on ecology, environmental geology and mineralogy, and transportation.

Instructional activities include: hands-on, independent research study, intensive laboratory use, and computer sessions. Furthermore, participants learn how to improve their problem solving, reasoning and communication skills in stimulating learning situations. A mentorship program is in place with local hospitals and private veterinarian practice offices. Art, drama and music electives are blended into the mathematics and sciences curriculum.

> **"...What I have learned in 'Pathways' will help me in my whole life, not just in school... I did better in math and science this year because I felt better about myself."**

"Pathways of Math & Science" has strong community and institutional support. It is linked to the **"Private Industry Council"** (PIC), which pays for three tutor aides and a clerical person for the program.

The second important program linkage is with the **"Upward Bound Program"** (UBP), a federal education program designed to increase the academic skills of high school students to motivate them to pursue post secondary education. Three high school graduates from the pool of UPB serve as tutor aides, role models, and mentors for "Pathways" students, preparing them for high school and college, and instilling self-esteem. All Summer Science Camp graduates are eligible for the "Upward Bound Program". Visiting *Project Director of the "Discovery Program" from Ohio, Maria Alberdeston,* says: **"...Having students who completed the Upward Bound Program work with the younger students was especially appealing to us."**



During an academic year follow-up activity, participants are engaged in hands-on work in State University of New York's College at Fredonia's science laboratory while carrying out DNA extractions.

"Pathways of Math and Science" Summer Science Camp participants and future scientists!

Both, the "Pathways of Math & Science" Summer Science Camp and the "Upward Bound Program," are the only student enrichment programs in this rural and economically depressed area.

Field trips to science-related institutions and guest speakers provide ample career exploration opportunities and tie in with the "Pathways of Math & Science" curriculum. A visit to the National Center for Earthquake Engineering Research at the University of Buffalo in New York allows participants to witness the applications of scientific knowledge to the practical problem of designing earthquake resistant buildings and structures by professional engineers; a trip to the Chautauqua Gorge in Westfield, New York enables them to study local geology and ecosystems; visits to the Great Lakes Science Center in Cleveland, Ohio, the George Mather Museum, a converted 600 feet Great Lakes freighter, provide information on geology, ecosystem, and transportation in relation to the Great Lakes and add more learning experiences.

The student retention rates during the summer program have been above 95%. An impressive academic achievement of participants is observed. In mathematics, students came to the program with an 83% overall math score, and left with an 85% overall score. The significant improvement of overall average science scores attests to the programs success: Students came to the "Pathways of Math & Science" with a 55% score in science and left with a post-test score of 84%!

Student Anne Zdrojewski, a 1994 and 1995 participant writes: **"...In my two years of 'Pathways of Math & Science' I have learned a lot about math, science, myself, and others.... what I have learned in 'Pathways of Math & Science' will help me in my whole life, not just in school.... In math, they teach you to calculate quickly, so you do not always need to use a calculator. In science, we did not just learn the names of rocks, we learned what they are used for.... I did better in school in math and science this year, because I felt better about myself."**

Co-Director Tadd Newell sums up his involvement with "Pathways of Math & Science" in a personal note: **"...The most satisfying part of my involvement in the Summer Science Camp is seeing the light come on in these children's eyes after they experience opportunities for exploration and discovery that are just not there in most educational settings."**

The young "Pathways of Math & Science" students are involved in the various stages of an archeological dig in West Seneca, New York.

1995 participant Waleska Alvalle says: **"...I was one of the many students that attended the 1995 'Pathways of Math & Science' program over the summer. I was a 7th grader that didn't know much about what layed ahead, and also I didn't know good study skills. Since I went to 'Pathways', I have been doing good in school ...I think it would be a shame not to let other students enjoy what I enjoyed that summer."**

Participant, Rachel A. Kwilos, even earned a certificate of appreciation from the National Science Foundation for her participation in the 3rd National Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C. in connection with "Pathways of Math & Science" in 1994.

Dr. Laila Denoya, Principal Investigator, strongly believes in the impact of early intervention programs on students' academic achievement. She says: **"...I have very often seen sophomores and junior high school students not willing to take advanced sciences or mathematics because either the students have had poor learning experiences in these fields, or they feel incapable of doing well in mathematics. They fear mathematics ...Hence, with programs like the Summer Science Camp, students can be encouraged at early stages to appreciate sciences and mathematics under the light of hands-on activities like computer use, science lab kits and tools, field research, graphing data and many other instructional activities to increase their interest and most of all self-confidence in mathematics and sciences."** •

CITY UNIVERSITY OF NEW YORK HEADSTART FOR COLLEGE CONTINUUM SUMMER SCIENCE CAMP IN NEW YORK

A total of 48 under represented 7th grade students have the chance to attend a four-week Summer Science Camp called **"CUNY Headstart for College Continuum Summer Science Camp"** held at **York College** of the **City University of New York,** which received funding from the **National Science Foundation**, augmented by funds from the New York City Board of Education and York College, CUNY.

Program Director Dr. Jack Schlein outlines the **goals** of his program: **"...to provide hands-on activities related to the science of daily life. The expected outcome is to have students take as much science and math as possible in grades 8 through 12 and to increase student interest in science as a career related field."**

Students and **parents** are welcomed into the program in an evening ceremony where they meet the **staff** of university faculty, public school teachers, and undergraduate student tutors.

Every morning, students are introduced to a variety of hands-on laboratory science experiments, designed to teach sciences by utilizing common, familiar objects such as clocks, radios, and cameras; allowing the participants to acquire knowledge about the basic scientific concepts and principles at work in these every day items. During the afternoon activities, the students are engaged in science research projects, facilitated by the Summer Science Camp staff.

Guest speakers from a variety of scientific and academic fields provide **career information.** Experts from the Polaroid and Xerox Companies, representatives of the New York College of Optometry, and artists showing students how to create musical instruments from everyday objects are invited to the Summer Science Camp. Their presentations are thematically tied into the curriculum.

The students' Summer Science Camp learning experiences are enhanced by **field trips** to the New York City Job and Career Center and a visit to the Vanderbilt Planetarium.

Program Director Jack Schlein believes that the **"...Summer Science Camp shows positive effects. Ninety-six percent of the selected students complete the program with perfect or near perfect attendance. One-hundred percent of the students are continuing their science education having enrolled in science in the next grades.... A survey of the students also shows a 119 percent increase in their interest in science..."**

The **academic year follow-up program** is designed to provide additional mentoring support and academic enrichment to reinforce and strengthen the Summer Science Camp's objectives. •

"...Ninety-six percent of the selected students complete the program with perfect or near perfect attendance. One-hundred percent of the students are continuing their science education having enrolled in science in the next grades.... A survey of the students also shows a 119 percent increase in their interest in science..."

NEW YORK

CITY UNIVERSITY OF NEW YORK RESEARCH FOUNDATION SUMMER SCIENCE CAMP IN NEW YORK CITY

Summer Science Camp results show students' learning experiences have prepared them to attend one of New York City's three specialized science high schools.

The New York Times could not help noticing the outstanding effort made by the City University of New York in putting in place a Summer Science Camp at Stuyvesant High School and the Pocono Environmental Education Center for 285 middle school students in 1995!

The **National Science Foundation** makes it possible for the **City University of New York**, working in close cooperation with the New York City Public Schools' High School Division to develop and implement the **Summer Science Camp** program for academically talented under represented 7th and 8th grade students selected from public middle and junior high schools.

The Summer Science Camp's main **goal** is to interest more students from under represented groups in applying for the three New York City specialized science high schools, to be accepted and ultimately excel after admission to these schools. The Summer Science Camp achieves this goal by: improving the students' proficiency in sciences, mathematics, and verbal understanding; offering challenging courses in mathematics, sciences, as well as humanities; introducing study skills; and exposing them to scientific career opportunities.

The six-week residential Summer Science Camp's introduction to the world of science, mathematics, and technology at Stuyvesant High School and the Pocono Environmental Education Center opens its doors to prepare these 285 students to pass the entrance examination for these New York City specialized science high schools: Stuyvesant High School, Bronx High School of Science, and Brooklyn Technical High School.

The Summer Science Camp participants meet in a structured high school setting for the first five weeks of the summer program, and spend the last program week at the Pocono Environmental Education Center. They participate in challenging classes, multicultural programs, and science projects to acquire knowledge not ordinarily imparted in a traditional educational setting. The students select formal classes and elective activities like: Mathematics, Verbal Skill

We proudly present the results of our research conducted while attending the "City University of New York Research Foundation Summer Science Camp," the "Math/Science Institute!"

BEST COPY AVAILABLE

A group picture of the "City University of New York Research Foundation Summer Science Camp"

Building, Literature, Mathematics Problem Solving, Computers, Sketch Drawing, Multicultural History, Science Research, and Creative Writing With A Multicultural Emphasis. The Summer Science Camp comprised three interrelated teaching approaches: lectures, laboratory work, and science experiments.

Students are taught by teachers experienced with high school curricula. In the science laboratory, the teachers work one-on-one with the students, which permits participants to explore and resolve their individual intellectual interests. In addition, current students from the three specialized science high schools in New York City, Stuyvesant, Bronx, and Brooklyn Technical High Schools, serve as role models, mentors, and tutors for the Summer Science Camp participants.

The program familiarizes the middle school students with the special educational opportunities available at the science and technology high schools, and introduces them to career opportunities in mathematics, science, and engineering.

Participants attend seminars and lectures presented by university faculty, special guests and practitioners in the fields of mathematics and sciences. A highlight of the Summer Science Camp program are the special science research projects. Students work in small groups to collaborate, design and display the results of their work at the end of the summer program.

The **follow-up program** continues the summer curriculum, and offers a review of mathematics and test taking skills, and homework assistance on a biweekly, hourly basis.

The *Program Director* admits that there is no guarantee that these students will get admitted into a specialized science high school, however, **"...they should excel in whichever high school they get into, because of the preparation they received at Stuyvesant..."** He places great value on the positive and encouraging learning environment the Summer Science Camp program provides to its mostly disadvantaged participants. •

Summer Science Camp participants "...should excel in whichever high school they get into, because of the preparation they received at Stuyvesant."

NEW YORK

JOHN JAY SUMMER COMPUTER CAMP IN NEW YORK

With funding from the **National Science Foundation** since 1993, the **City University of New York's John Jay College of Criminal Justice** has continued to conduct a five-week intensive commuter Summer Science Camp, the **"John Jay Summer Computer Camp"**, for 60 under represented students entering 7th through 9th grade in selected New York City schools.

The 'John Jay Summer Computer Camp's' main emphasis is on the participant's development of abstract reasoning and problem-solving skills.

The program is modeled after the **TexPrep curriculum**, with modifications to suit local conditions. Its main emphasis is on the participants' development of abstract reasoning and problem solving skills.

In the 1995 Summer Science Camp, the O.J. Simpson case was a content focus in the **curriculum.** The importance of forensic science became visible through a number of science activities related to this case, such as DNA, finger print and blood analysis.

During the Summer Science Camp, students follow a structured course schedule from Monday to Thursday of computer science, logic, probability, statistics and problem solving. Team-teaching techniques are employed during students' projects with a strong focus on cooperative learning techniques.

Older students work for the "John Jay Summer Science Camp" as assistants and role models. Peer-tutoring is encouraged through the formation of academic fraternities.

On Fridays, informal **field trips**, for example to the Museum of Natural History and the Liberty Science Center, along with hands-on project workshops and career counseling, round off the activities.

Guest speakers provide participants with additional personalized exposure to the multitude of **career opportunities** in the fields of sciences, math and engineering. They also serve as role models.

During the **academic year**, science workshops and career counseling continue on a weekly basis. The curricular focus of the follow-up activities is on mathematics.

Program Director Dr. Lily E. Christ concludes her evaluation as follows: **"...Students were cooperative and actively involved in the varied aspects of the program and maintained daily journals to enhance their writing skills. Students, working alone or in pairs, started to work on approved projects. All students are required to give an oral report on their project at the follow-up meetings during the academic year.... The program's success was outstanding."** •

Work in the computer laboratory during the "John Jay Summer Computer Camp" is fun!

BEST COPY AVAILABLE

NEW YORK

LIBERTY ENVIRONMENTAL SCIENCE ACADEMY IN NEW YORK

The **"Liberty Environmental Science Academy" (LESA)** is a three-and-a-half-week Summer Science Camp serving 40 under represented 7th through 9th grade students from the Community School District #3 in Manhattan, including Central Harlem, at rural Bard College. It is funded through a 1993 **National Science Foundation** grant to **Bank Street College** and the **Liberty Partnership Program**, a New York State funded educational program.

The Program Director describes the project and its **goals: "...There are several rays of hope coming out of New York's Harlem and Upper West Side. One glimmer comes from the 'Liberty Environmental Science Academy'.... It provides adolescents in at-risk situations with stimulating exposure to the study of science and language arts."**

With the National Science Foundation Summer Science Camp and the Liberty Partnership Program, these inner-city youths receive enriching, alternative learning experiences that give them a glimpse of the world of science.

The project's **curriculum** is developed by the Bronx Botanical Garden's Institute of Ecological Studies. Its field investigation content alternates every summer between terrestrial and aquatic ecology. The outdoor biological strategies familiarize the participants with organisms and their environments. Mathematics is continually incorporated into the program.

Students receive career counseling and attend the "Writing to Learn Math & Science" course taught by a strongly dedicated math and sciences **staff.** They thus gain science literacy through the development of critical inquiry and communication skills, along with hands-on laboratory and fieldwork experiences.

Field trips provide the opportunity for hands-on natural resource study. Students go berry picking at Montgomery Place, rock climbing at the Mohank Preserve and orienteering at Bowden State Park.

> "...There are several rays of hope coming out of New York's Harlem and Upper West Side. One glimmer comes from the 'Liberty Environmental Science Academy'..."

A field investigation in aquatic ecology, conducted by attendants of the 'Liberty Environmental Science Academy.'

Students of the 1995 "Liberty Environmental Science Academy" help each other forge trails during a visit to the Mohonk Preserve.

Former Summer Science Camp participant and current University of Rochester student Jenny Laracuente talks about her positive experiences with LESA: **"...Through Liberty Partnership Program I attended the 'Liberty Environmental Science Academy'; I enhanced my writing skills and explored the sciences. In 1994 I applied for the 'Capstone Program', and was accepted. This allowed me to take college courses instead of the regular curriculum. I learned how strong and capable I was through handling college classes. I developed excellent study skills, which put me on the honor roll."**

Eric Wiliams went through the program, and then worked as counselor, too. He now attends SUNY Westport. **"...For most of these kids,"** he says, **"...if they didn't come, they'd probably just be standing on the corner. Like I told some of my boys, you're going to see the same people standing in the same place when you get back 20 days later. A lot of them wish they could stay out here longer."** •

"For most of these kids, if they didn't come, they'd probably just be standing on the corner. Like I told some of my boys, you're going to see the same people standing in the same place when you get back 20 days later."

Community College student David Crespo says: **"...This was really my first time out of New York City, and as an eleven year old who had never experienced such beautiful surroundings, I was immediately hooked. First of all, I found out that I could overcome my fears about doing something new and different. Secondly, I can learn to work with others. Thirdly, I had the chance to be exposed to environmental science.... I continued the program every year, and eventually became a counselor."**

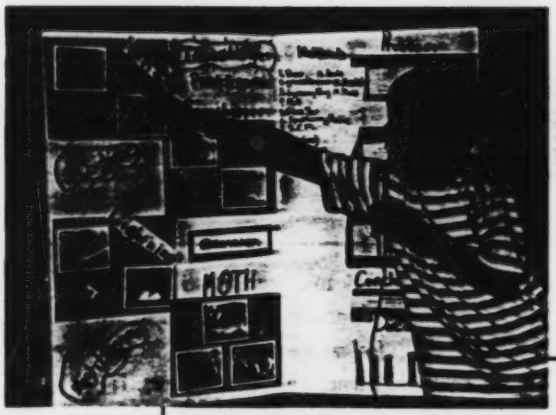
Bank Street

SUMMER MICROSCOPY INSTITUTE SUMMER SCIENCE CAMP IN NEW YORK STATE

Participants of the "Summer Microscopy Institute" Summer Science Camp are presented with the chance to use high-technology microscopy equipment! Since 1995 sixty incoming 7th grade under represented students selected from 10 schools in the **Newburgh Enlarged City School District** in New York State have spent four weeks at the **National Science Foundation** and Texaco Foundation funded the commuter Summer Science Camp called **"Summer Microscopy Institute"**.

The "Summer Microscopy Institute's" **objective** is to provide students with the goal orientation needed for success in school, at work, and in life in a program where all attendants engage cooperatively in teams and are incited in problem solving activities.

The "Summer Microscopy Institute" **curriculum** offers different learning activities each week. The first week, students are involved in research methodology by investigating owl pellets, learn how to access information, and use computers to research background information about their science research projects. For the remaining three weeks they work on their self-selected science research projects, using high-technology microscopy equipment including scanning electron microscopes and a transmission electron microscope.



A young student presents the research results from his science project, which utilized high-technology microscopy equipment.

Eight high school students, who are members of the New York State Science Honor Society and currently enrolled in higher level sciences courses, provide mentoring services to the younger program participants, and serve as excellent role models. **"...This interaction between older and younger students contributes to the program's uniqueness and success,"** according to *Program Director Dr. Annette Saturnelli.*

The "Summer Microscopy Institute" offers two novel activities: 1) "Breakfast with the PROs" time is scheduled every Tuesday. The "PROs" are professional scientists and engineers from nearby industries, who join the participants for informal conversations during

"Breakfast with the PROs": a unique career exploration opportunity for participants of the Newburgh 'Enlarged School District' "Summer Microscopy Institute."

their breakfast. Each "PRO" makes a brief presentation about his or her life and professional development, beginning from the time when they were the same as age as the Summer Science Camp participants up to the present. A question-answer period follows, and then the "PROs" share their expertise with the participants by mentoring them in their school labs. 2) "Visiting the PROs" time is scheduled every Wednesday: to observe the "PROs" at work shows the Summer Science Camp participants the applications of sciences in the real world.

On Fridays, science olympiads are held, engaging the students in teamwork to complete their science projects. Attendants are expected to give two formal presentations to all Summer Science Camp participants. These presentations are videotaped to be shown on the night of the "Summer Microscopy Institute's Awards Program".

"...The Awards Program was the highlight...I could have just cried at each child's face as he/she received the award."

Recipients of the first four awards are chosen by their peers. *A counselor writes:* **"...The Awards Program was the highlight.... I could have just cried at each child's face as he/she received the award."** The middle school students are presented with certificates in categories like "Most Skillful Operator of the Sputter Coater", "Most Skillful Operator of the Video Microscope", "Team Leadership", and others.

All participants are encouraged to share their learning progress in the "Summer Microscopy Institute" with their **parents**.

Follow-up activities during the academic year scheduled for Saturdays include further classroom and laboratory sciences activities, and career and academic counseling sessions for parents and students.

Post-program questionnaire answers reflect the "Summer Microscopy Institute's" success. Students particularly liked the non-traditional, hands-on approach to science and the interaction with local scientists. The overwhelming majority of participants hopes to return to the program the following year. •

BEST COPY AVAILABLE

SCIENCE TRAINING & EDUCATION PROGRAM SUMMER SCIENCE CAMP IN NEW YORK STATE

From 1993 to 1995, and again in 1996, the **State University of New York College at Old Westbury** successfully linked New York State Education Department and **National Science Foundation** funds to enable 50 under represented 7th and 8th grade middle school students from six neighboring school districts to attend a four-week commuter **Summer Science Camp** each year. This Summer Science Camp complements the New York State funded **"Science Training & Education Program" (STEP)** for high school students, and the **"Collegiate Science Training & Education Program" (CSTEP)** for college studentsat SUNY Old Westbury.

All three math and sciences enrichment precollege programs have the **goals** to encourage under represented students' academic success in science and technology and to motivate them to pursue careers in these fields.

The Summer Science Camp program provides a comprehensive science and math **curriculum** to improve the students' skills in mathematics, language arts, and basic sciences. It provides the participants with career exploration activities and motivational incentives to work toward careers in scientific, technological, and engineering professions.

The Summer Science Camp design is in two levels: Summer Science Camp Level 1 (SSC 1) for 7th grade students, and Summer Science Camp Level 2 (SSC 2) for 8th grade students.

SSC 1 participants study the ecological food chain and wildlife of Long Island in field exercises. SSC 2 participants conduct experiments on the College at Old Westbury grounds in order to understand ecological principles and the value of field study.

The Summer Science Camp 7th and 8th grade participants work in teams with the high school STEP participants, providing an enriching and motivating learning atmosphere and excellent role models to the Summer Science Camp participants. Together with the high school students in the "STEP" program, the Summer Science Camp students create a folder entitled: "Summer Science Camp: What We Have Learned About The Planet Where We Live".

Field trips allow the participants to visit the Queens College Environmental Center at Lloyds Neck, the New York

The Summer Science Camp provides the participants with career exploration activities and motivational incentives to work toward careers in scientific, technological, and engineering professions.

Participants enjoy hands-on learning experiences in the science laboratory at the State University of New York's College at Old Westbury.

The lucky attendants of the "Science Training and Education Program's" (STEP) Summer Science Camp.

Aquarium, Brookhaven National Laboratory, and the Bronx Zoo.

Cultural activities and physical recreation, study skill workshops, hands-on science seminars, and writing workshops round off this Summer Science Camp and account for its overall success.

During the **academic year** Summer Science Camp participants' achievement in school is tracked, and they are enrolled in the "Science Training and Education Program" as soon as they enter high school. Junior high school science project workshops provide the Summer Science Camp students with a chance to conduct their own science research during the year and enter it in the STEP Science Fair and other local competitions. STEP high school graduates are then encouraged to join SUNY College at Old Westbury after graduation, and are channeled toward the "Collegiate Science & Technology Program" (CSTEP), which is targeted for college students.

In summary, the SUNY College at Old Westbury has developed an outstanding math and sciences educational pipeline: beginning with the "Summer Science Camp" for 7th and 8th grade students, leading to the "Science Training & Education Program" at the high school level, and finally the entry of students into the "Collegiate Science Training & Education Program" at the college level.

"...The close linkage of these programs, along with the continuous work of students and parents, guarantees a foundation for these under represented students' sustained interest in science and math, as well as an encouragement to pursue a career in the field of science, engineering and math," says *Program Director Dr. Henry Teoh.* •

BEST COPY AVAILABLE

NATIVE SCIENCE FOUNDATION
SUMMER SCIENCE CAMP IN NEW YORK STATE

In 1995 the Public Broadcasting System selected the newly National Science Foundation funded "Native Science Foundation Summer Science Camp" to be included in a documentary on environmental scientists of African-American, Hispanic, and Native American heritage.

This **"Native Science Foundation Summer Science Camp"** is set up by the **State University of New York at Potsdam** to assist 50 Mohawk students entering 7th, 8th and 9th grade in meeting the challenge of science and mathematics school courses, to reinforce their knowledge of basic mathematics and science concepts in an exciting learning environment, to show them the relevance of science, engineering and mathematics, and ultimately to instill in them the interest in careers in these fields.

The program site is the University's Star Lake Campus in the Adirondack Mountains. Potsdam College is located about 30 miles from the St. Regis Mohawk Reservation, which spans the Canadian border and has a Native population of over 10,000 habitants.

The "Native Science Foundation Summer Science Camp" **curriculum** provides participants with academic classes in four modules: 1) the "Science Reinforcement" module, covering the topics of chemistry, biology, and earth science; 2) a "Mathematics Reinforcement" module, focusing on the development of basic math skills; 3) the "Environmental Science" module, and 4) a module called "Writing Across the Curriculum." Each class is taught by a Master Teacher with experience in the middle or early secondary classroom. The **staff** has completed additional training in science and mathematics content enrichment, Native American culture, the creation of interdisciplinary curricula, and in meeting the needs of gifted and talented Native American students.

> **"The program's goal is to help participants enjoy their classes and convince them to stay in school, but it also refreshes the professors that get involved. It challenges them to truly teach instead of simply reciting a lecture in front of the class."**

Classroom units are planned according to the learning styles often attributed to Native American students: active learning, an appeal to observational skills, direct references to Native American issues, supervised participation, clarification of the practical value of learning, and the involvement of students in personal mastery rather than in competition with peers. Training is provided through Potsdam College and Dwight D. Eisenhower fund. Native American culture is infused throughout the Summer Science Camp curriculum.

BEST COPY AVAILABLE

A teacher and students prepare to dissect a shark in a hands-on science lab activity during the "Native Science Foundation Summer Science Camp."

Science and mathematics classes reinforce concepts that students need to succeed in the 7th, 8th, and 9th grade classroom according to the New York State syllabus. The classes emphasize hands-on and outdoor participatory learning. For example, algebraic concepts are strengthened by students measuring a selected tree outside. They find that the tree is much easier to measure using shadows, angles, and algebraic equations rather than climbing the 200 and more feet using a ruler. Science units expose students to the scientific method and involve them in creative projects such as building food chains, as well as creative and group problem solving activities. The environmental science class teaches students the techniques and methods they need for their afternoon field experiences.

The weekly themes of the science projects include: Plants, Earth, Water, and Air. Hands-on activities include Canada Goose Banding, the incubation of pheasant eggs, soil sampling and wolf watching. *The director of Wolf Watch*, a non-profit organization dedicated to the preservation and protection of wolves, brought her wolf to the Summer Science Camp program in 1995 to share information and experiences with the students, some of whom belong to the Mohawk Wolf Clan.

"Writing Across the Curriculum" involves students in newsletter writing and journalism to assist their own learning in other classes, and as a means of building self-expression and self-esteem into their lives.

Field trips to sites like the Robert Moses Power Dam, Eisenhower Lock, and the Wilson Hill Goose Banding Site provide the participants with real life applications of program activities.

Parents serve as chaperones on these field trips. Additionally, the Mohawk Education Committee, comprised of Mohawk parents and educators, meets on a regular monthly basis to be involved in planning Summer Science Camp activities and to provide student support.

Career exploration takes place in workshops with scientists and other professionals involved with science, like the director of the St. Regis Mohawk Environmental Division, or representatives from the New York State Power Authority, and the American Indian Program at Cornell University.

The "Native Science Foundation Summer Science Camp" program ends with an awards ceremony for students, friends and family.

Academic year follow-up activities comprise of field trips to the Canadian Museum of Science and Technology in Ottawa, and regular meetings of participants with members of the Mohawk Educational Committee, who serve as mentors for the participants.

One program graduate was awarded the Betty and Merton Evans scholarship at SUNY Potsdam, an indication of the program's success in enabling its participants to excel in and continue their education.

SUNY Potsdam's director of Native American Affairs, Denise D. White points out additional positive effects of the "Native Science Foundation Summer Science Camp": **"...Part of the program's goal is to help participants to enjoy their classes and convince them to stay in school, but it also refreshes the professors that get involved. It challenges them to truly teach instead of simply reciting a lecture in front of a class."** •

BEST COPY AVAILABLE

ROCHESTER INSTITUTE OF TECHNOLOGY SUMMER SCIENCE CAMP IN NEW YORK STATE

The **Rochester Institute of Technology** received funds from the **National Science Foundation** from 1992 to 1995 to conduct a **Summer Science Camp (RIT - SSC).** Thirty-one under represented 7th and 8th grade Rochester City School District students are selected annually to participate in this exciting RIT-Summer Science Camp, where the **curricular focus** is on seven areas of engineering and the basic sciences.

The program's **goal** is to attract under represented students to careers in the fields of mathematics, engineering, and sciences, and to enable them to successfully complete their academic studies in these fields.

Field Trips and tours of the academic and dormitory facilities at the Rochester Institute of Technology and the University of Rochester enrich the students' academic summer experiences.

Follow-up activities during the academic year include technical and industrial enriching learning projects for students. Several seminars given by skilled facilitators cover a variety of interactive subjects concerning parenting skills for raising young teenagers, and areas related to college preparation relevant for both, **parents** and students. The "RIT SSC" maintains contact with its participants by inviting them to attend an annual winter reunion and a meeting in April, where registration material is distributed to the participants for college courses available in the summer. The University of Rochester provides scholarship funding for these students.

The "Rochester Institute of Technology Summer Science Camp" is closely linked with the "Pre-Freshman Engineering Program" (PREP) at the Rochester Institute of Technology, which is proudly sponsored by the Department of Energy, Mobil Chemical and Eastman Kodak since 1988. More than half of the thirty-one National Science Foundation Summer Science Camp participants were accepted into this "Pre-Freshman Engineering Program" at the Rochester Institute of Technology in the summers of 1994 through 1996. In addition, two Summer Science Camp participants served as teaching assistants in the PREP 1995 Program

> "By capturing their imagination at an early age, the students continue on the road of high academic achievement... for science-based careers."

In the words of *Summer Science Camp Program Director Dr. Ellson:* **"...These facts point to the wisdom of providing an enriching math/science/engineering program for middle school students. By capturing their imagination at an early age, the students continue on the road of high academic achievement ...for science based careers."** •

R·I·T

SUMMER SCIENCE CAMP AT SUNY STONY BROOK IN NEW YORK STATE

Renowned **State University of New York College at Stony Brook** has been able to offer a four-week residential **Summer Science Camp** to 40 under represented students entering 9th grade in Suffolk County schools every year from 1993 to 1995 thanks to grant from the **National Science Foundation** in 1992.

The program's **goal** is to significantly increase the numbers of under represented students entering sciences, engineering, and mathematics studies and careers by utilizing the strong physical sciences, mathematics, and engineering departmental resources at the Stony Brook College. The Summer Science Camp participants live with counselors/teaching assistants in a campus dorm shared with high school students in similar science and technology entry programs. Cultural, social, and recreational activities are offered.

The Summer Science Camp **curriculum** focuses on four research-based explorations during the four summer weeks: 1) The Hydrogeology research and study project of the Long Island Pine Barrens Ponds provides students with an opportunity to participate in an original research project that investigates the flow patterns and water chemistry of a group of interconnected ponds in eastern Long Island. The Pine Barrens region has become the focus of intense study in recent years due to its environmental sensitivity and ecological importance. The students' results of this module may be accessed on the World Wide Web. 2) The module on Fibonacci and Tessellation focuses on students' investigations of fibonacci numbers, numbers that are uniquely found in nature. Participants also build a kaleidoscope and create tessellations by using a mosaic kit to build a symmetric, tessellating pattern. 3) Workshop sessions in the Transtech Laboratory allow participants to explore transportation systems and the interaction of math, science, and technology by engaging in a variety of hands-on activities. During the culminating learning activity of this course, the students learn how technology can be used to protect passengers during motor vehicle crashes. 4) A module on Robotics and Motion is designed to let students discover how a variety of plants and animals move. Participants then construct robotic devices that imitate these movements.

The students' "Hydrogeology of the Secret Ponds" report can be read on the world wide web by visiting: "Hydrogeology Summer Research Experience for Ninth Graders."

Research, data collection, analysis, and field experiments comprise most of the participants' morning schedule. The afternoon curriculum involves students in learning activities with a focus on art and humanities. Students explore mask-making in the context of self-representation, and discuss the novel "The Giver" by Lois Lowry, utilizing it to improve their communication skills.

Parents are very involved in the Summer Science Camp program. They form a "Parents Advisory Council", which meets on a regular basis, visits the campus, and attends the closing ceremony at the end of the Summer Science Camp to witness students' presentations of their science research projects and artwork.

Summer Science Camp attendants are engaged in a large number of **academic year** activities during the fall and spring. They participate in science lab explorations in engineering, technology, geology, and telecommunication at the SUNY Stony Brook campus, visit the Long Island Museum of Natural Sciences, and the New York Hall of Science in Queens, NY. Students are required to enroll in home school-based math and sciences clubs, led by their home school teachers.

The Summer Science Camp participants' newsletter and research publications attest to their gain of knowledge in sciences, engineering, technology, and mathematics generated by the Summer Science Camp experience in a variety of unique, innovative, and fun learning experiences. •

BEST COPY AVAILABLE

RENSSELAER SUMMER SCIENCE ENRICHMENT PROGRAM (RS²EP) IN NEW YORK STATE

Funding from the **National Science Foundation** from 1993 to 1996 has enabled **Rensselaer Polytechnic Institute** to conduct a residential five-week Summer Science Camp, the **"Rensselaer Summer Science Enrichment Program"**, for 50 under represented 7th, 8th and 9th grade students selected from 23 target schools in Albany, Schenectady, and Troy City school districts in New York State.

with an ideal opportunity to develop skills addressing and coping with people from diverse backgrounds and attaining leadership skills ...In these times of fiscal changes, Summer Science Camps provide needed opportunities for inner city and rural youth... To engage middle school youth in educational summer enrichment programs expands the presence of college and universities in local schools and communities ..."

"...As difficult as it is for middle school children to give up a good chunk of their summer vacation to attend a challenging academic program, our daughter's experience has positively changed her outlook on school and future career options."

This Summer Science Camp program seeks to prepare its participants to successfully pursue their high school coursework in mathematics and sciences, and to be academically well equipped in these fields for postsecondary education leading to careers in sciences, engineering, and health professions.

Program Director Mark Smith enlarges on his Summer Science Camp's **goal** and uniqueness: **"...This National Science Foundation funded Summer Science Camp provides rare opportunities for young men and women to seek an intellectual and social experience on a college campus.... This Summer Science Camp...attracts students from a wide range of school, cultural, and class backgrounds, thus providing participants**

The Rensselaer Summer Science Camp **curriculum** reinforces hands-on chemistry and technology laboratory work in project-oriented, teambuilding learning activities. Participants are divided into five teams. Each team works on a science project facilitated by local public school teachers, and graduate and undergraduate students from the Rensselaer Polytechnic Institute who serve as tutors and role models for the young Summer Science Camp participants. These team projects place special emphasis on developing participants' problem solving and science research skills. Mathematics are a critical part of the instructional process and integrated throughout the curriculum.

Sciences, engineering, and health professions career exploration opportunities are provided through **field trips** to local industries, science museums, and close interaction in mentorship settings with the Rensselaer Polytechnic Institute **faculty,** professional scientists and engineers.

At the 1995 Summer Science Camp closing ceremonies, **parents** acknowledged the importance of the Rensselaer Polytechnic Institute Summer Science Camp and the need to maintain it in future years. One *parent* put it this way: **"...As difficult as it is for middle school children to give up a good chunk of their summer vacation to attend a challenging academic program, our daughter's experience has positively changed her outlook on school and future career options."**

In order to continue the efforts of the Summer Science Camp, participants are enrolled in **follow-up activities** in the Rensselaer Polytechnic Institute's academic year precollege program. •

Rensselaer

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Hostos Community College, Bronx, New York	150	6 weeks	8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Bronx Zoo, Bronx, New York	35	4 weeks	8	1, 2, 3, 4, 5, 7, 9, 10
Community School District #23, Brooklyn, New York	75	6 weeks	7, 8, 9	1, 2, 3, 4, 5, 7, 8, 9, 10
Science Skills Center, Brooklyn, New York	50	5 weeks	3 - 8	1, 2, 3, 4, 5 6, 7, 8, 9
SUNY at Fredonia, New York Fredonia, New York	48	6 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
CUNY York College, New York Jamaica, New York	50	4 weeks	7	1, 2, 3, 4, 6 7, 9
CUNY Research Foundation, New York, New York	300	4 weeks	7, 8	1, 2, 3, 4, 5 6, 7, 9, 10
John Jay College of Criminal Justice, New York, New York	60	5 weeks	7, 8, 9	1, 2, 4, 5, 6 7, 8, 9
Bank Street College, New York, New York	40	3 ½ weeks	7, 8, 9	1, 2, 3, 4, 5 6, 7, 8, 9, 10
Newburgh Enlarged School District, Newburgh, New York	59	4 weeks	7	1, 2, 3, 4, 5 6, 7, 8, 9, 10
SUNY College at Old Westbury, Old Westbury, New York	50	4 weeks	7, 8	1, 2, 3, 4, 6 7, 8, 9, 10
SUNY at Potsdam, Potsdam, New York	49	4 weeks	7, 8, 9	1, 2, 3, 4, 5 7, 8, 9, 10
Rochester Institute of Technology Rochester, New York	31	2 weeks	8, 9	1, 2, 3, 4, 6 8, 9, 10
SUNY at Stony Brook, Stony Brook, New York	40	4 weeks	9	1, 2, 3, 4, 5 7, 8, 9, 10
Rensselaer Polytechnic Institute, Troy, New York	50	5 weeks	7, 8, 9	1, 2, 3, 4, 5 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

JOHNSON C. SMITH UNIVERSITY'S SUMMER SCIENCE CAMP IN NORTH CAROLINA

With funding from the **National Science Foundation** in 1994, **Johnson C. Smith University** is able to conduct a four-week intensive residential **Summer Science Camp** for 60 under represented 7th, 8th, and 9th grade students. **"...The program seeks to address the need for a scientifically literate society, and to help reverse the declining achievement, interest, and participation of under represented students in science and mathematics..."** says *Program Director Dr.Benjamin Dias.* **"...To this end, we continue to seek to enrich and supplement the middle school experience, raise educational aspirations, empower parents to become more effective in helping their children achieve their potential, and encourage and increase enrollment and success in college."**

Johnson C. Smith University's Summer Science Camp draws its program participants from a variety of feeder linkage programs: the AETNA Saturday Academy program, an academic year math and science program; the Kiddie Kollege program, a hands-on science and math program for children in K through 6th grade; the Charlotte Mecklenburg International Baccalaureate program; and the Mathematics and Science Apprenticeship Center program.

The critical components of the Johnson C. Smith University Summer Science Camp program are classroom activities, speakers, field trip experiences, and parental participation. The Summer Science Camp program focuses its **curriculum** on classroom activities in biology, chemistry, computer science, physics, mathematics, and problem solving skills. Scientific methodology and research skills are introduced and improved as the students make observations, collect and analyze data, and draw conclusions throughout the classroom sessions and field study experiences.

> **"The program seeks to address the need for a scientifically literate society, and to help reverse the declining achievement, interest, and participation of under represented students in science and mathematics."**

Scientists, engineers, teachers, health professionals, college admissions directors, and the African-American astronaut Dr. Bernard Harris form a cadre of speakers who talk to the participants about career opportunities, staying in school, going to college, and majoring in science-related subjects. Participants are encouraged to begin thinking about careers in science and math, and to consider teaching as a career option, too. Being a residential program, participants have the added occasion to experience living and studying in a college environment.

Field trip experiences include visits to industries like the Hoechst Celanese Corp. research facility in Charlotte, science museums like the Rock Hill Museum in South Carolina, the IBM manufacturing and assembly of microcomputers facilities, medical schools, colleges, and landmarks like the imposing Georgia Dome, and the "World of Coke", in Atlanta, Georgia.

Parental participation plays a central role in the program, as parents are involved at some level in all Summer Science Camp activities. Each evening two or four parents are invited to have dinner with the middle school attendants.

A Saturday **follow-up component during the academic year** provides additional mentoring while students continue to work on their summer science projects.

The positive outcome of the Summer Science Camp at Johnson C. Smith University is reflected in the students' improved performance in science and mathematics courses in their respective schools, which makes them prone to stay in school longer, to study science-related subjects in college, and to choose science-related careers. •

MATH/SCIENCE SCHOLARS' PROGRAM AT BENNETT COLLEGE IN NORTH CAROLINA

Support from the **National Science Foundation** from 1992 to 1995, and again in 1996, has enabled **Bennett College** to conduct a residential six-week Summer Science Camp for 50 local under represented 7th through 9th grade students, called the **"Math - Science Scholars' Program"**. The program also allows a number of out-of-state students to participate.

The Math-Science Scholars' Program provides daily classroom experiences built into a **curriculum** of biology, chemistry, computer sciences, English, mathematics and physics.

Students prepare to conduct a pendulum study in the physics laboratory.

The program's **objectives** are: to motivate these students to pursue careers in mathematics and sciences, and to thereby increase the number of under represented students in the field of sciences. A broad range of hands-on mathematics and sciences activities in the classrooms and laboratory shows the importance of these fields in the participants' lives. The program also seeks to improve participants' study and research skills and builds their self-esteem.

The Summer Science Camp uses a mentor/mentoree approach in its research activities. Participants are divided into small groups under the guidance of an instructor, and select a science or math-related project, such as construction of a DNA model or assembling and testing rockets. Once the project is selected, students work together to develop a hypothesis, collect data and determine their findings. The students are encouraged to write and present their papers related to their research experiences as part of the English class assignments. The Bennett College Greenhouse, Animal Laboratory, and science and computer labs are utilized in support of these research projects.

The overall **curriculum** focus of the Summer Science Camp is to challenge students to master computational, communicative, and research skills in an intensive multi-media approach. High school teachers serve as Summer Science

BEST COPY AVAILABLE

Camp **staff**, strongly supported by graduate students serving as mentors, and assisting the students in their science-oriented projects.

Weekly **field trips** provide an outlook into possible careers in science and mathematics. Participants visited, for example, a biotechnology center involved in gene transfer, Bennett College's departments of industrial and chemical engineering, and the headquarters of Dudley Products, Inc., which is involved in cosmetology, to see the manufacturing operation for skin care and biological products. This site visit ended with a motivational presentation given by the founder and CEO of the company. As part of the "Math - Science Scholars Program's" career counseling component, a diverse number of under represented scientists and mathematics professionals are invited to share information about their careers.

Parents are strongly involved in the program. Once a week they are invited to the Summer Science Camp to view the students' work. The camp ends with a banquet and an award ceremony for students, parents, and staff. The President of Bennett College was the keynote speaker, reflecting the institutional support of the Summer Science Camp.

A 21-week **follow-up program** during the academic year on Saturdays at the college keeps students focused on their science skills and overall academic progress. Eighty-five percent of the camp participants say they do consider careers in sciences, and there is a measurable improvement of science and math performance. Fifty-one percent of the participants have maintained a grade point average of at least 3.01 in mathematics; forty-seven percent of the participants have maintained a grade point average of at least 3.0 in sciences.

The *parents of participant Aaron Showers* state that their son **"...commented especially about the hands-on science and biology work. We believe he has increased his math score as a result of the program. We like the tutorial sessions."**

Summer Science Camp participant Albert A. Rhodes-Lester says about his Summer Science Camp learning experiences: **"...I learned a lot of new things and am able to set a realistic goal to become a meteorologist...I would recommend others to take advantage of this wonderful experience."**

Dr. Gloria R. Scott, President of Bennett College, says in her letter: **"...I have had the opportunity to visit ...with participants in the program.... I sincerely feel that the hands-on experiences in the classroom ...have stimulated a keen interest in many of the participants ...and have been moved to pursue careers in math and sciences as a result of their Summer Science Camp experiences."** •

Summer Science Camp participant Albert A. Rhodes-Lester says about his Summer Science Camp learning experiences: "...I learned a lot of new things and am able to set a realistic goal to become a meteorologist...I would recommend others to take advantage of this wonderful experience."

BEST COPY AVAILABLE

SPORT SCIENCE CAMP IN NORTH CAROLINA

"Sports and Sciences" is the unique **curricular** focus of the four-week commuter Summer Science Camp that the **National Science Foundation** has funded with the **University of North Carolina at Greensboro** since 1994 . The **"Sport Science Camp"** targets 48 under represented 6th, 7th and 8th grade students who demonstrate potential leadership qualities in sports and abilities in science or math. The program utilizes sport activities as a medium for teaching scientific concepts and for increasing the students' interest in learning various concepts from the fields of sciences and mathematics. Participants come from the North Carolina Piedmont Triad region.

The "Sport Science Camp" design starts with pre-testing sessions, to then teach the concepts of scientific modes of inquiry to the students. Each day a new scientific concept is introduced. Students are split into small groups to collect, plot, and analyze data in relation to other variables, whether dependent or independent, and compute means and variations. During the last two weeks of the program, the staff discusses these mini-concepts: exercise physiology, biomechanics, aspects of energy, movement, circulation, respiration, temperature control, anatomy, forces of inertia, friction, acceleration, and velocity.

Students engage in unique outdoor science activities: a balloon toss on a field allows for examination of physics principles like gravity, absorption, and restitution.

Dr. Allan H. Goldfarb, Director of the "Sport Science Camp", states: **"...We tried to employ the scientific concepts introduced in the mornings into fun activities in the afternoon."**

The instructional and research activities of this "Sport Science Camp" begin with breaking the students up into small groups to work on hands-on, inquiry-based projects in the laboratory and classroom, which familiarize them with the basic concepts of exercise physiology, and sport biomechanics. Later, they become subjects of their own experiments when they are involved in physical activities designed to integrate performance and scientific theory. In the 1995 "Sport Science Camp" program, the research projects focused on aspects of circulation, respiration and anatomy.

The **staff** consists of science, math and physical education teachers from local schools, University of North Carolina professors, and several graduate students, who all serve as mentors to the students.

Career options in the field of sport science are discussed with participants.

> One participant said, "My science grade has gone from a 'C' in 6th grade to an 'A' in 7th grade."

Parents are kept informed of activities and students' academic performance.

The program led to a measurable improvement of participants' knowledge in the field of science and math. *Program participant Vera Ihearnacho* writes that her **"...report card has improved since last summer...The program has helped me in school in math and science. In math, my grade went from a 'B' to an 'A'. In science my grade went from a 'C' to a 'B'. I enjoyed working with you and hope to be there next year."**

Lemuel Lamar Holmes, another participant, expresses his happiness since he has been in the University of North Carolina at Greensboro's "Sport Science Camp" program , because **"...my science grade has gone from a 'C' in 6th grade to an 'A' in 7th grade."**

Curiously, **no field trips** are scheduled for the participants during the four weeks of the program. However, the unique pedagogical use of sports, an activity greatly enjoyed by most younger students, obviously contributes to the "Sport Summer Science Camp's" continued success! •

BEST COPY AVAILABLE

CAPE FEAR SUMMER SCIENCE CAMP IN NORTH CAROLINA

The **University of North Carolina at Wilmington** conducted two four-week commuter programs during the summer of 1994 and two sessions in 1995, the **"Cape Fear Summer Science Camp"**, funded by the **National Science Foundation** to serve 50 under represented students. The program's **goal** is to increase the representation of under represented students in the fields of science, engineering and mathematics.

This Summer Science Camp provides the participants with hands-on experiences that develop the skills of observation, measurement and analysis required for careers in the field of sciences.

The main **curricular focus** is on coastal science. The disciplines of biology, chemistry, physics, math, geology, astronomy and psychology are integrated into the curriculum.

Activities include classroom instruction and laboratory work. Field exercises with an emphasis on coastal science allow all students to actively participate in a research project examining the dynamics of coastal geology in a barrier island environment. **Field trips** to zoos and science museums complement the program and help to strengthen the relationship between laboratory work and science carried out in the field. The **staff** consists of accomplished public school science and math instructors. Graduates of previous programs support the staff as peer mentors.

Career exploration opportunities and career day trips are offered to the participants by professionals working in the sciences, who are also engaged in a mentoring relationship with program participants.

Follow-up activities during the academic year include academic instruction, as well as additional field trips and the creation of a newsletter concerning Summer Science Camp projects and future sciences projects during the school year.

A successful student outcome of this Summer Science Camp is the receipt of a first place award in the National Science Foundation research competition at the National Conference on Diversity in the Scientific and Technological Workforce held in Washington, D.C. in 1994 for one participants' coastal geology project. A good indicator for "Cape Fear"'s continued success! •

Field trips to zoos and science museums complement the program and help to strengthen the relationship between laboratory work and science carried out in the field.

UNCW

ROANOKE RIVER VALLEY CONSORTIUM SUMMER SCIENCE CAMP (R^2VCS^2C) IN NORTH CAROLINA

The **Roanoke River Valley Consortium**, which consists of five school systems located in rural, poverty-stricken northern North Carolina, offers a four-week residential Summer Science Camp, funded by the **National Science Foundation** for 50 under represented students selected from the 8th grade in partnership with the **North Carolina Central University**. The "Roanoke River Valley Consortium Summer Science Camp's" **goal** is to create a cohort of students, to provide them with the foundation for a lifelong interest in science and math, and to encourage them to consider the sciences, engineering, and math as possible career choices.

Students attentively follow a demonstration in the science laboratory.

The "Roanoke River Valley Consortium Summer Science Camp" has an innovative project design consisting of the pre-residential camp activities, the four-week residential program, and follow-up events.

> One student stated, "The number one thing I liked the most was the learning that was involved..."

The residential Summer Science Camp program **curriculum** focuses on physical science and mathematics, integrating life and earth science courses, laboratory science experiments, and computer usage. The instructional delivery comprises of hands-on/minds-on activities in cooperative learning groups, and via computer applications.

The "Roanoke River Valley Consortium Summer Science Camp" **staff** of college professors and master teachers are assisted by college students. **Field trips** are designed to reinforce the classroom and laboratory work.

The innovative **pre-summer academic year activities** consist of "After-School Meetings", "Saturday Seminars", and a "Mentoring Program". **Parents** are enrolled in workshops to increase students' confidence in their academic abilities; career counseling sessions and research assistance are set up for students by the "Roanoke River Valley Consortium Summer Science Camp" staff. The **follow-up program activities** focus on a mentorship program and the establishment of an alumni group to supply continued career counseling and involvement in math and science through high school.

Program Director Dr. Shirley Turnage states that **"...the R^2VCS^2C is an excellent program using curriculum integration, team teaching, and hands-on laboratory applications to provide students with direct experiences."** *One Summer Science Camp participant* states: **"...The number one thing I liked the most was the learning that was involved..."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Johnson C. Smith University, Charlotte, North Carolina	62	4 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Bennett College, Greensboro, North Carolina	140	6 weeks	7, 8, 9	1, 2, 4, 6, 7, 8, 9, 10
University of North Carolina, Greensboro, North Carolina	49	4 weeks	6, 7, 8	1, 2, 4, 6, 7, 9, 10
University of North Carolina, Wilmington, North Carolina	50	4 weeks	6, 7, 8	1, 2, 3, 4, 6 7, 8, 9
Roanoke River Valley Consortium, Windsor, North Carolina	50	4 weeks	8	1, 2, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SCIENCE-ENGINEERING-MATHEMATICS-PROJECT (MU-SEMP) IN OHIO

The residential four-week Summer Science Camp **"Science-Engineering-Mathematics Project" (MU-SEMP)**, located at the **Miami University at Oxford in Ohio**, funded by the **National Science Foundation** in 1993, follows its inquiry-based summer program **curriculum** in math, science and computer science by linking Summer Science Camp participants during the academic year with two outstanding math and sciences enrichment projects in Southwestern Ohio: the statewide initiative **"Discovery"**, located on the Miami University at Oxford campus, and the also National Science Foundation funded regional **Alliance for Minority Progress, "Minorities in Mathematics, Science & Engineering"**, located in Cincinnati, Ohio.

The Miami University at Oxford in Ohio Summer Science Camp called "Science-Engineering-Mathematics Project" (MU-SEMP) involves 52 under represented 7th and 8th grade students from the Cincinnati and Dayton metropolitan, and surrounding rural areas.

The program offers instructional activities in nine challenging classes: math, science, computer applications, engineering, library/Internet study, rocketry, technical writing, model building, and orienteering. In addition, the participants' research, study and communication skills are enhanced. Students are involved in morning academic classes. During the afternoons, they attend lab sessions and work in cooperative teams on many different topics, like genetic aspects of the fruit fly, molecular biology, recombinant DNA techniques, and plant growth. The students are led and mentored during these research activities by professional scientists from Miami University at Oxford.

Professional scientists from Procter & Gamble and the National Weather Service provide conferences in career exploration opportunities and their reflections on mathematics and sciences applications to the real world.

Field trips to science museums, businesses and educational organizations serve the same purpose.

A **staff** of college faculty and students, middle and high school teachers provides an inspiring learning environment. **Parents** play a distinctive role in the Summer Science Camp, both during the summer and the academic year program by serving as teaching assistants and mentors to the participants. Older high school students participate in the Summer Science Camp as tutors for the younger students.

"...The representation of different ethnic groups in the program's staff largely contributes to its success."

In 1994, *MU-SEMP participant Lindsey McDougle* was a winner in the science fair at the 4th Annual Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C., where she presented the results of her science research project done in the Summer Science Camp.

MU-SEMP engages participants in hands-on science laboratory activities like measuring the growth of bean plants.

The respective home schools become the sites for the **academic year follow-up activities**, which mainly focus on providing continued academic support for participants of MU-SEMP. Topics for the follow-up sessions are selected by home school science teachers and the Summer Science Camp staff.

Program Director Dr. Iris DeLoach Johnson believes that **"...MU-SEMP is unique because of the wide variety of backgrounds of the participating young students, ...and because it so strongly involves parents during the summer."**

Co-Director G. Nathan Carnes thinks that **"...the representation of different ethnic groups in the program's staff also largely contributes to its success."** •

BEST COPY AVAILABLE

PREP/TECH INSTITUTE
SUMMER SCIENCE CAMP IN OHIO

"Our experience with PREP/TECH has been highly encouraging. Although the University and private sector are supporting this effort, we need additional support in order to continue and expand this effort."

Along with the Engineers Foundation of Ohio, the Department of Energy and the **National Science Foundation,** the **University of Toledo in Ohio** has sponsored the six-week **"PREP/TECH Institute Summer Science Camp"** for approximately 100 under represented 7th through 9th grade students since 1993.

The program focuses on providing its participants with the opportunity to increase their knowledge and skills in mathematics, science and language arts, along with promoting enjoyment of these disciplines. Participants' critical thinking abilities are challenged and developed through daily classroom exercises and laboratory projects, which employ a hands-on approach to problem solving. The students' understanding of the scientific and technological process is increased, too.

"PREP/TECH" is an intensive, skills development, creative and holistic academic enrichment program which addresses the mathematics, science, language and intellectual needs of its participants.

The six-week "PREP/TECH" program is broken down into two separate periods. First, a three-week introduction to basic scientific principles is followed by the application of ideas and principles to sciences and math projects. Math, statistics, research methodology, computer and writing skills, analytical and graphical skills, all are fully employed in the students' special projects. Then, the "PREP/TECH" participants return for the following three weeks of hands-on laboratory instruction. They are divided into two groups. One group of participants works on an engineering project, building a full-size paper car. The second group of students studies the problem of homelessness in America. Students investigate this societal problem, try to explain it and offer solutions using their math, graphing, data collection and analysis skills. Participants publish a booklet showing the results of their surveys and interviews conducted with regard to the theme of "Homelessness". To complete this special science and math project, students are involved in helping to renovate a dilapidated house in the community. These projects provide positive educational experiences for the participants.

Community members, members of civic organizations and scientists, along with parents come to the program as mentors, guest lecturers and role models. The "PREP/TECH" **staff** consists of

University faculty and undergraduate college students.

The college students keep providing after-school tutoring in mathematics, sciences, language arts, social studies, and foreign languages during the **academic year follow-up activities**, which are mainly laboratory sessions and mathematics and sciences classes.

Parent Blondell Dixon describes her daughter's successful participation in the program: **"...My daughter was among the first PREP/TECH students. I remember how hesitant she was about adventuring into science and math classes because of fear of failure...I have watched her thrive after the intensive classroom and tutorial assistance she received in this National Science Foundation funded program."**

University of Toledo's Vice President for Academic Affairs writes in his letter to the National Science Foundation: **"...Our experience with PREP/TECH has been highly encouraging. Although the University and private sector are supporting this effort, we need additional support in order to continue and expand this effort. As such, we urge your continuing support of this program."**

Young "PREP/TECH" students in the "Homelessness Project" get hands-on science experience while helping to renovate a dilapidated house.

Business support is strong. *Dwayne E. Clark, Director of Affirmative Action, Security and Community Affairs at Owens-Illinois, Inc.*, states: **"...we are proud to be an independent sponsor of ...students in the PREP/TECH program. It is the company's desire to do its part to improve ...student involvement in the study of math and sciences."**

University of Toledo, Ohio President Frank E. Horton explains: **"...I fully support the PREP/TECH Program...a unique program which targets inner-city 7th and 8th grade under represented students whose grades in science and math are at "C" or below... This program services a targeted population who have expressed interest in improving their grades and standardized test scores, particularly in science and mathematics in order to ultimately enroll in engineering, mathematics and science-based career majors in institutions of higher learning."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Miami University at Oxford, Oxford, Ohio	52	4 weeks	7, 8	1, 2, 4, 5, 6, 7, 8, 9, 10
University of Toledo, Toledo, Ohio	100	6 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

EXPLORING CONTEMPORARY BIOLOGICAL DILEMMAS SUMMER SCIENCE CAMP IN OKLAHOMA

The "Native Americans in Biological Sciences" program at **Oklahoma State University** is designed to interest college-bound Native American students to move into careers in the life sciences and to provide the necessary support. This program is supported by the Howard Hughes Medical Institute, the National Institutes of Health, and the National Science Foundation.

Now, one of its major and new components is the residential four-week Summer Science Camp **"Exploring Contemporary Biological Dilemmas"** for 30 under represented 8th and 9th grade students, which is funded by the **National Science Foundation.** Advisory boards composed of parents, tribal leaders, teachers, and administrators coordinate participant recruitment.

As the title indicates, each year's program centers on a significant and real-life scientific dilemma which is addressed by the Summer Science Camp students. During the 1993 program students worked on the specific dilemma to determine whether the water treatment plant of a local town was releasing environmentally safe water. In 1994 the dilemma focused on whether innovative uses might be found for native Oklahoman plants, and if so, who would have ownership of these uses. The 1995 dilemma centered on determining whether the construction and maintenance of a radioactive waste disposal facility on local Indian tribal lands would have adverse effects on plant and animal life in the area.

> Presentations from outside speakers with opposing views on the dilemma help participants seek solutions.

During the first week of the program, participants are presented with the scientific dilemma to investigate. This is done in association with presentations from outside speakers with opposing views on the problem to be addressed. Students are rotated through mini-workshops which expose them to some of the disciplines and techniques which might be of use in approaching the scientific dilemma. Participants then split into interdependent research groups, which focus on different areas of the problem and cooperate to find a solution over the next three weeks. The proposed research projects combine field and laboratory components in regard to the specific scientific dilemma.

A variety of disciplines are included in the "Exploring Contemporary Biological Dilemmas" **curriculum** with a strong environmental emphasis: life sciences, engineering, statistics, economics, as well as library, writing and presentation skills. All groups make use of computers to compile their results, present their findings at the end of the camp orally, and each group prepares a written report.

The key to this program is that **faculty and teachers act only as facilitators**, while the students do the entire "dilemma" sciences project from the formulation of project goals and approaches to the presentation of findings at the end of the Summer Science Camp. This hands-on, inquiry-based approach introduces them to the life and work of scientists.

Local industry and community members provide further insight into relevant scientific research and **career opportunities**. Members of the local Native American tribes address issues relevant to the preservation of their culture, and traditional views of the environment and sciences.

Summer Science Camp program is coordinated with **academic year follow-up activities** such as science clubs, speaker programs, and financial aid information.

An enhanced academic performance, changes in attitude toward science and school, and a desire to return the next year, are evidence of the camps success! •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Oklahoma State University, Stillwater, Oklahoma	32	4 weeks	8, 9	1, 2, 4, 5, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SUMMER ENVIRONMENTAL EXPLORATIONS & DISCOVERIES (S.E.E.D.) IN PENNSYLVANIA

The U.S. Department of Energy's Pre-Freshman Enrichment Program (PREP) originally funded the successful Summer Science Camp program for middle school under represented students in Doylestown, Pennsylvania. In 1993 the **National Science Foundation** took over and awarded funding to the **Delaware Valley College S&A** in Doylestown, Pennsylvania to conduct its four-week residential Summer Science Camp, called the **"Summer Environmental Explorations & Discoveries" (S.E.E.D)**, for 60 under represented 7th grade students.

The Delaware Valley College built the "Summer Environmental Explorations & Discoveries" in strong and close partnership with the Philadelphia School District and the Honey Hollow Environmental Education Center operated by the Audubon Society of Pennsylvania. The Program Director works with a liaison person to arrange visits to the target schools to meet with prospective participants and their parents. This allows for recruitment of good students with low interest levels in math and sciences.

S.E.E.D. participants study seaside ecosystems on a field trip to Island Beach State Park in New Jersey.

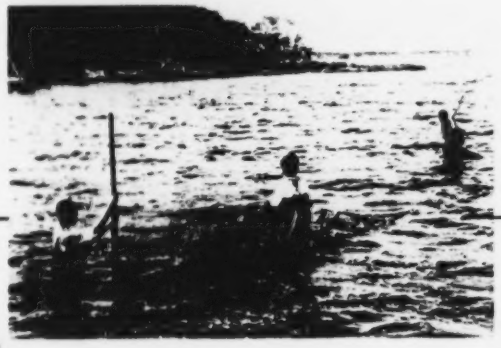
aquatic ecology, terrestrial ecology and man in the environment.

The Summer Science Camp has scheduled the mornings for the participants to receive innovative instruction in sciences and to be involved in hands-on activities related to environmental science projects. In the afternoons, participants improve their information acquisition and data analysis skills by using the Delaware College library to collect information on their science fair research projects. They also produce a yearbook which highlights the major Summer Science Camp activities.

Participants improve their data acquisition and analysis skills by using the Delaware College Library to collect information on their science fair research projects.

The program's **goal** is to improve the students' basic math, science knowledge and communication skills. The thematic **curriculum** focus of the Summer Science Camp is on environmental issues, covering four science areas: ecosystems,

Field trips are coordinated to support the Summer Science Camp activities and are the major components of the program. A special trip to the Island Beach State Park in New Jersey provides opportunities for the students to study seaside



Participants at the Island Beach Park in New Jersey, studying seaside ecosystem.

Students participate in team building activities.

ecosystems. Fossils are collected in the Pocono Mountains for further analysis.

Career information is provided by successful scientists and professionals who are invited to inform the participants about the different career options in math, the sciences, and environmental fields after graduation from college.

Parents are encouraged to participate in the Summer Science Camp program's activities. They also attend the graduation ceremony and presentation of their sons' and daughters' science projects exhibited at the Summer Science Camp fair event held on the last day of the program.

In the **academic year follow-up activities**, participants of "Summer Environmental Explorations & Discoveries" program become part of the **"Legacy Program"**, which provides on-site supplemental counseling and tutoring services for participants. The "Legacy Program" is supported by minority scientists and engineers and focuses on career development of under represented members of the community. This type of program linkage, where financial and human resources are maximized, endorses the advancement of young participants in education, and allows them to achieve their highest academic potential and goals. Both of these enrichment programs provide hopeful alternatives to the unfortunate reality of the urban neighborhoods most participants inhabit.

Program Director Dr. John C. Mertz believes that **"...perhaps more than anything else, the close ties between the campers and the staff..." make his program unique and account for its continued success.**

One parent writes in her thank-you note to Dr. Mertz: **"...My son enjoyed the program immensely. I am sure he will never forget his experiences at Delaware Valley.... He would like to be considered as a junior counselor when he gets older.... SEED is wonderful!"**

During the academic year follow-up, Summer Science Camp participants become part of the "Legacy Program", to receive supplemental tutorial services.

BEST COPY AVAILABLE

CENTRAL EAST REGION SUMMER SCIENCE CAMP (CERSSC) IN PENNSYLVANIA

During the summers of 1995 and 1996, fifty under represented talented 7th grade middle school students have the opportunity to participate in the **School District of Philadelphia's** four-week Summer Science Camp funded by the **National Science Foundation**. Participants are selected from nine target schools in the Central East Region of the school district.

The program is designed to encourage these students to see the relevance of science in their daily lives, to feel confident about their skills and knowledge in the fields of science and mathematics, and to develop career awareness in science and related fields.

The **"Central East Regional Summer Science Camp"** attendants take an inquiry-based, hands-on approach to complete problem-based sciences research topics related to the environment. Activities in five major areas are offered to the participants during the program: 1) Environmental Awareness Research, 2) Laboratory Explorations, 3) Problem Solving Skills, 4) Computer and other related Technology Skills, and 5) Field Trips.

The focus of the 1995 summer science program was on: "Urban Land Use and Its Impact on Water", a journey into technology and environmental research. Students investigated urban land use along the Delaware River and the water quality of various creeks and points along the Delaware estuary; they, then analyzed data collected along the Delaware River, used spreadsheets and graphs to interpret water quality data, generated site maps, and ended this module by developing and orally presenting a research paper on this topic.

"...Each week we went on trips to test water from rivers, lakes, and streams in the Philadelphia area...During our travels together we saw how some waterways were clean, and others terribly polluted."

Student Nathan A. Hall reports: **"...Each week we went on trips to test water from rivers, lakes, and streams in the Philadelphia area...During our travels together we saw how some waterways were clean, and others terribly polluted."**

On each **field trip** students have work assignments that stimulate an interest in a variety of career roles, such as being a researcher, photographer, cartographer, materials manager, and reader.

BEST COPY AVAILABLE

Participants start to develop their science fair projects during the Summer Science Camp, and continue to work with their home school teachers seminars. The National Organization for the Professional Advancement of Black Chemists and Chemical Engineers holds workshops for students and their

"...We stand in front of our classrooms and sell the American Dream, we tell our children that they are our future, and that science can open up a world of possibilities to them...With this National Science Foundation Summer Science Camp Program, we put money where our collective mouths have been...Please, don't pull the plug on this excellent investment! We cannot afford to do so!"

on these research projects during the **academic year follow-up program**, in order to enter them in their school district's Regional Science Fairs. This long-term commitment to a science research project engages these students in a continued intensive learning process. Other follow-up activities are: Saturday computer classes and science parents to learn about career opportunities in science, mathematics, and engineering.

Science and Summer Science Camp teacher Deborah Bambino sums up the overall positive outcomes of the program and asks for further funding in her letter: **"...The program has a pronounced positive effect on the children. They learn about scientific research methods and basic science skills.... If this program is not sustained, it becomes one more broken promise for children who have already faced too many disappointments....We stand in front of our classrooms and sell the American Dream, we tell our children that they are our future, and that science can open up a world of possibilities to them...With this National Science Foundation Summer Science Camp Program, we put money where our collective mouths have been...Please, don't pull the plug on this excellent investment! We cannot afford to do so!"** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Delaware Valley College, Doylestown, Pennsylvania	60	4 weeks	7	1, 2, 4, 5, 7, 8, 9, 10.
Philadelphia School District, Philadelphia, Pennsylvania	100	4 weeks	7	1, 2, 4, 5, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SUMMER SCIENCE CAMP FOR SOUTHWESTERN PUERTO RICO

With funding from the **National Science Foundation**, the **"Summer Science Camp for Southwestern Puerto Rico"** takes place on the **San German campus of Inter American University of Puerto Rico** in the summer of 1996 to serve 75 mostly under represented 8th and 9th grade students from nearby schools.

The program's main **goal** is to encourage and prepare the 75 participants to consider careers in the sciences, engineering, or mathematics, to develop their commitment to study, and provide them with experiences in research during the course of the program.

The Summer Science Camp **curriculum** focuses on participatory activities in: 1) math and computer sciences, 2) physical sciences, and 3) life science. All students are rotated daily through these three group activities during the mornings. In the afternoon, each student develops a research project in a special area of interest. Participants discover the characteristics of the scientific method, mathematical reasoning, problem solving, and the usefulness of calculators and computers.

In math and computer sciences the main topics are: 1) measurements, variables, parameters, and models in an electric circuit; 2) linear models, linear equations, and matrix calculations; 3) electronic spreadsheets; 4) functions, graph, families and function operations; and 5) data interpolation and polynomial regression. All topics are discussed using calculators and computers.

Topics in the physical sciences module are: 1) force and energy in simple machines; 2) electric circuits; 3) magnetism and electric machines; 4) electromagnetic waves: generation, reception, and applications; 5) chemical properties of substances and chemical reactions; and 6) environmental problems.

The mathematics and science-related field trips include a visit to a mangrove swamp, an excursion into a tropical forest, a visit to the radio astronomic observatory in Arecibo, and a computer factory.

Topics in the biological sciences are: 1) the process of life, observation of an organism; 2) life diversity, observation of an ecosystem; 3) genetics and the encoding of life in the DNA; 4) life in the sea; and 5) endangered species of Puerto Rico.

The topics emphasize connections among each other. For example, participants measure electrical currents and voltages in a circuit. Based on these sciences activities, they formulate models to explain the observed quantities; using mathematics, they then predict and corroborate through experiments the behavior of new circuits, finally discussions of chemical properties are related to electric forces and the

BEST COPY AVAILABLE

San German Interamericana

OJO AL TIGRE

atomic model, and even environmental problems are related to chemical substances. Data collection in any of the areas is analyzed through the statistics techniques of regression or interpolation. The Summer Science Camp staff shows very concrete and applied aspects of each mathematics or sciences research topic, emphasizes connections, and motivates inquiry among students; the participants have to go one step further into the details in their special research projects.

The mathematics and science-related **field trips** include a visit to a mangrove swamp, an excursion into a tropical forest, a visit to the radio astronomic observatory in Arecibo, to a computer factory, a pharmaceutical factory, and the facilities of the University of Puerto Rico and its advanced research laboratories, with special guests talking about their math and sciences professions and career choices.

The Summer Science Camp **staff** has a broad experience working with precollege students, assisting them in science fair projects, designing educational materials for school, as well as research and teaching experience at the university level. The tutors are selected among the best undergraduate students, to be role models and at the same time friends or big brothers/sisters of the participants.

The **follow-up activities during the academic year** focus on assisting students in their science projects and science courses. The participants' home schools are in the neighborhood of the campus, which allows for frequent visits for additional support.

Parents are involved in the Summer Science Camp from the beginning. They receive information about the program's goals and activities, are invited to social events, and asked for collaboration in the follow-up activities. •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Inter American University at San German, Puerto Rico	75	5 weeks	8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

UNIVERSITY OF RHODE ISLAND NATIVE AMERICAN SUMMER SCIENCE CAMP

A grant from the **National Science Foundation** and the Academy of Applied Sciences allowed the **University of Rhode Island** to offer a three-week commuter Summer Science Camp from 1992 to 1995 in collaboration with the Narragansett Indian Tribe for 50 under represented students selected from 7th through 9th grade in Massachusetts, Connecticut, and Rhode Island.

The **"University of Rhode Island Native American Summer Science Camp"** has the **goal** to increase under represented middle school students' interest in engineering.

The program's **curriculum** centers on Engineering, Mathematics, and the Sciences, trying to include Native American tribal culture into all activities. The students participate in a variety of projects in mechanical, electrical, ocean, and civil engineering: They build radios, fly airplanes, navigate the Internet, design and launch chemical rockets, sample and test water quality, use computers to design structures, design Native American flutes, and build canoes.

Other enrichment activities include weekly **field trips** to science museums, for example the Boston Museum of Science, and the American Museum of Natural History in New York, visits to places of scientific and cultural interest like Mystic Seaport, and local "high tech" industries. American Indian scientists from around the country come as guest speakers to the Summer Science Camp to share their career experiences with the young participants. All attendants are encouraged to engage in a variety of recreational, physical activities as well.

Parents and siblings are urged to participate in the Summer Science Camp's activities. **"...We invited the older siblings in as junior leaders, and we've invited the parents and younger siblings to consider the camp activities and field trips as a family outing,"** says *Program Director Mark Lindall.* The Summer Science Camp seeks to ease the parents' traditional distrust for the education system and involve them in their children's education.

An **academic year follow-up program** is scheduled to take place at the University of Rhode Island's campus each Wednesday afternoon for homework assistance, opportunities to "surf" the Internet, and visits to different University departments. The local chapter of the American Indian Science and Engineering Society joins forces with the University of Rhode Island for conducting these follow-up sessions. All former participants of the Summer Science Camp are tracked throughout their high school and college years.

Principal Investigator Dr. William Ohley understands the need for a science and mathematics enrichment program geared toward Native American students only too well. He himself was initially discouraged from pursuing a science career as a young man. His own perseverance allowed him to become one of very few Native Americans with a doctorate degree in engineering. He says in an interview with The Boston Sunday Globe in 1993: **"...These kids are often automatically tracked into lower levels...It happened to me..." He believes that Native Americans can bring a unique view and inspiration to the field of engineering: "...A lot of good advances come from people who look at scientific problems from a creative perspective...And that's what I tell my ...students: You guys have the ability to solve problems from a different perspective, and you can do things differently and may be even better than what society has done."** •

> "I tell my students...you can do things differently and maybe even better than what society has done."

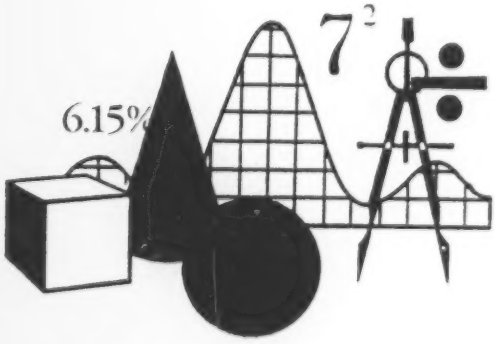
Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
University of Rhode Island, Kingston, Rhode Island	50	3 weeks	7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SEEKERS SUMMER SCIENCE CAMP IN SOUTH CAROLINA

The regional National Science Foundation "Alliance for Minority Participation", the "Center of Excellence in Math and Science Education", "Clemson University's Career Workshop", "Tools for Enrichment and Advancement in Math and Science", "Visions for Youth", the "Cooperative Extension Service/4-H", the "South Carolina Peak Institute", the "Houston Center for the Study of the Black Experience Affecting Higher Education", and **Clemson University** all worked together in a collaborative effort to set up the **National Science Foundation** funded four-week residential **Summer Science Camp called "Seekers"** in 1995, to serve 7th and 8th grade under represented students from 10 counties in South Carolina.



The program's **goals** are to increase the number of under represented students entering college preparation curricula, their enrollment in high level math and science courses, and ultimately their participation in science, engineering and math careers with the help of a **staff** of college professors, 4-H facilitators, math and science public school teachers, and graduate students who act as instructors and mentors at the same time.

The **curricular** disciplinary focus is on mathematics, particularly statistics, as applied to a variety of sciences and technical curricula. Physical, earth and life science are studied in the classroom, in hands-on science laboratory activities, and real world settings. The first three weeks of the curriculum deal with the application of mathematics to electricity, aerospace, and the environment, using a hands-on approach to statistics based on the Quantitative Literacy materials developed by the National Council of Teachers of Mathematics (NCTM). Research activities take place in the classroom, lab, and outdoors. Students learn and develop research skills such as note taking, take readings, and comparing results.

One program segment familiarizes students with **careers** in the fields of mathematics, sciences, and engineering, especially in aerospace, electricity, and the environmental sector. Contact with

scientists and other professionals in mentorship roles provides opportunities to participate in the applications of mathematics in chemistry, physics, biology, and astronomy. .

The middle school students are placed in two 4-H camp locations during the first three weeks, allowing for ample opportunities to investigate the environment and participate in healthy

"...Over the course of the grant, more than 300 children and their families will be affected by the Summer Science Camp program...One can only imagine the impact these 300 children will have on our nation as they become scientists, engineers, innovators and inventors."

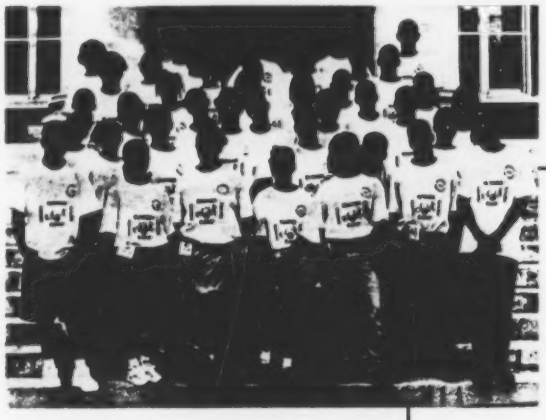
recreational activities. Week one of the Summer Science Camp takes place at Long Leadership 4-H Center located near Aiden in South Carolina. The second and third weeks take place at Cooper Leadership 4-H Center in the beautiful Santee-Cooper recreational area. During the last week, students live in the Clemson University dorm, where they can enjoy the campus atmosphere and familiarize themselves with its numerous sciences, engineering, and mathematics research laboratory facilities.

Program Director Herman G. Green summarizes student benefits from the program: **"...For a number of participants, this was a first-ever camp experience.... Many were surprised to learn that science and math can be fun, especially when using hands-on learning experiences. Participants were made aware of ...career opportunities in science, engineering, and mathematics. They learned to explore the worlds of science and math beyond the classroom."**

During the **academic year follow-up activities** "Seekers Clubs" are set up in the student communities, facilitated by 4-H personnel, to engage participants in intensive academic reinforcement activities.

Parents and students are pleased with their learning experiences, improvement of skills in the fields of math and science, and the increased interest in science stated after completion of the program.

Clemson University President Constantine W. Curris comments on the special impact this program has: **"...Over the course of the grant, more than 300 children and their families will be affected by the Summer Science Camp program...One can only imagine the impact these 300 children will have on our nation as they become scientists, engineers, innovators and inventors."** •



The proud group of "Seekers Summer Science Camp" participants!

BEST COPY AVAILABLE

SUMMER MATH AND SCIENCE CAMP IN SOUTH CAROLINA

"...The competitive position of the United States is in jeopardy due in part to the drop in the number of engineering and science graduates that it is producing."

Funding from the **National Science Foundation** in 1995 allows **Benedict College** at Columbia in South Carolina to establish its first math and sciences enrichment program for 50 under represented 7th and 8th grade students on campus in a five -week **"Summer Math and Science Camp"**.

Its **goals** are: to increase the number of under represented students entering sciences, mathematics, engineering, and technology careers; to motivate these students to remain in school; to help them understand science and future scientific questions; to assist them to become more self-reliant in their school work; and to capture the attention and assistance of parents while preparing them to support their children's education.

This Summer Science Camp is conducted in conjunction with the ongoing "Middle School Summer Laboratory Science and Mathematics Enrichment Program" (MSSEP), serving students entering 5th and 6th grade, which is partially funded by the National Science Foundation and the United States Department of Education.

The **curricular disciplinary focus** of the "Summer Math and Science Camp" is on mathematics, problem solving skills, life and earth sciences, the application of computer technology, and scientific communication skills. The math and sciences modules provide participants with a head start for their further academic careers. Computer literacy is a major focus of the "Summer Math and Science Camp", enabling students to apply their computer knowledge to their school work. A module on "Scientific Communication" centers on reading and writing skills development with special emphasis on analytical skills and the scientific method.

During the Summer Science Camp program, the participants receive instruction in the classroom and engage in science laboratory activities from Monday through Thursday for six hours per day. Fridays are scheduled for **field trips**, motivational and recreational activities, guest speakers, and special science projects. Tutoring services are available for students lacking self-confidence or comprehension of the subject matter.

Science is interesting at Benedict College's "Summer Math and Science Camp"!

BEST COPY AVAILABLE

Mentor and student proudly presenting "Sickle Cell Anemia: causes and effect" at the Benedict College Middle School Academy of Science.

Summer Science Camp Program Director Dr. Juanita S. Scott clearly states the need for establishing and funding "Summer Math and Science Camp" at Benedict College: **"...The competitive position of the United States is in jeopardy due in part to the drop in the number of engineering and science graduates that it is producing...The rationale for the proposed Summer Science Camp program is that by providing students with skills-oriented mathematics and laboratory instruction, and opportunities for science research, they will be motivated toward sciences and will develop technical and analytical skills that they can use in the sciences as well as other disciplines and life in general..."**

"...by providing students with skills-oriented mathematics and laboratory instruction.... they will develop technical and analytical skills that they can use in the sciences as well as other disciplines and life in general..."

Academic and career counseling in the field of math and sciences is provided by the **staff**, and further **career information** is offered by visiting professionals from the fields of sciences, math, computer science, and engineering, and during field trips to various sites of scientific interest like the South Carolina Department of Health, the Environmental Control Laboratory, South Carolina Electric and Gas, Discovery Fair, and the Congaree Swamp.

Parents receive orientation through workshops and other activities to assist and support their children's education and career choices.

Academic year follow-up activities are scheduled to continue the enhancement of the Summer Science Camp participants' math and science skills; they are enrolled in the "Benedict College Middle School Academy of Science", which helps to promote the establishment of science clubs at the local middle schools. Benedict College also conducts a Saturday Science Academy on campus during the academic year. •

SUMMER SCIENCE CAMP
AT THE UNIVERSITY OF SOUTH CAROLINA

"...The most significant achievements include the marked and measurable improvement of the participants' algebra and physical science skills...."

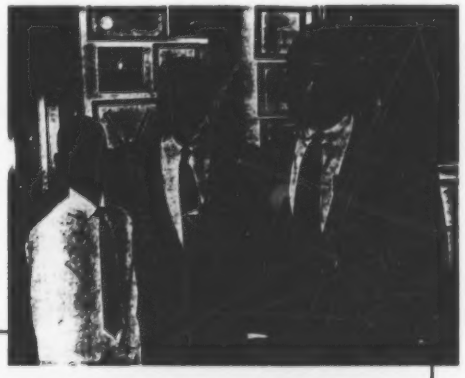
To assist the efforts to achieve the statewide goal of restructuring science and math education in grades K through 12, the **University of South Carolina** received funding from the **National Science Foundation** in 1993 to conduct a four-week residential **Summer Science Camp**, working closely together with another National Science Foundation program in South Carolina, the **"Alliance For Minority Participation"**. A total of 44 under represented students entering 8th and 9th grade from rural areas attend the Summer Science Camp.

The program **curriculum** addresses algebra, physical science and chemistry, fostering the students' interest and ability to succeed in these subjects, and preparing them for college and professional careers in the fields of science, engineering, and mathematics.

Program Director Dr. T. Scott Little says: **"...The most significant achievements include the marked and measurable improvement of the participants' algebra and physical science skills, and the development of science and math manuals transferable to a rural classroom setting."**

This National Science Foundation Summer Science Camp attracted the attention of CBS, and it was featured in numerous newspaper articles statewide. The program's outstanding performance was promoted as a highlight on WLTX Channel 19 News, a CBS affiliate, in 1995. The segment included video footage of participants as they completed mentored engineering projects.

An outstanding Summer Science Camp student outcome is the fact that participant Devine Johnson was awarded the honor to represent the 1995 Summer Science Camp on a trip to Washington, D.C., where he had the unique chance to meet with two South Carolina Senators: the Honorable James Strom Thurmond and the Honorable Ernest F. Hollings. The National Science Foundation's investment in these precollege programs has an unforgettable impact on the young beneficiaries. •



Participant Devine Johnson was awarded the honor to represent the 1995 summer program at the NSF's Annual Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C. Together with Principal Investigator Dr. T. Scott Little, the young student had a chance to meet with the Honorable South Carolina Senator James Strom Thurmond.

BEST COPY AVAILABLE

SUMMER SCIENCE EXPLORATION CAMP IN SOUTH CAROLINA

Several local newspapers reported on **Claflin College's** successful **"Summer Science Exploration Camp"**.The *President of Claflin College, Dr. Henry N. Tisdale*, comments on the outstanding **National Science Foundation** funded 1995 Summer Science Camp by saying: **"...Throughout the summer, our campus was abuzz with activity...program activities that attracted many young students from the local community...We were all made to feel a keen sense of pride as we observed from a distance...This summer has been special indeed...The classroom learning, the social interaction, and the subsequent growth that took place at Claflin College ...were not only most beneficial to the students who participated, they were also good for us."**

The "Summer Science Exploration Camp" provides unique opportunities for hands-on work on science projects.

The "Summer Science Exploration Camp" **curriculum** consists of interactive, multi-disciplinary, hands-on experiences and demonstrations in the applications of sciences and technology. Participants

"...The classroom learning, the social interaction, and the subsequent growth that took place at Claflin College... were not only most beneficial to the students who participated, they were also good for us."

Claflin College's four-week commuter "Summer Science Exploration Camp" serves 51 under represented 7th through 9th grade students from Orangeburg and neighboring counties with the **goal** to instill the importance of science and technology at an early age, and to develop and help the students to acquire the problem solving, critical thinking, and algebraic skills needed for careers in these fields.

are instructed in reading scales, optical equipment, engineering, drawing, computer usage, electricity, graphic calculators, chemical configurations and analysis, technical writing and presentation skills. During the "Summer Science Exploration Camp", one finds that all instructional activities are proceeded by explorations of relevant sciences applications in the various fields. Attendants have a chance to learn and enjoy

BEST COPY AVAILABLE

teamwork. The highlights of the Summer Science Camp are the **field trip** activities, which invite students to work side-by-side with professional scientists and technicians.

Industries like Holman Cement Company, Holly Hill, Albermarle Corporation, Union Camp, and the local Department of Public Utilities generously support the Summer Science Camp program by donating their personnel and supplies to interest the "Summer Science Exploration Camp" participants in careers in science, engineering, and mathematics.

Project Director Dr. S. N. Ekpenuma states: "Our Summer Science Exploration Camp has been well received by parents, students, and teachers. It is the first application-oriented, comprehensive science and technology commuter-based program that has ever come to Orangeburg and its surrounding communities in the county."

Parents are involved in the program by assisting with Summer Science Camp activities.

Academic year follow-up activities are undertaken during weekends, continuing to utilize the strong community support in engaging the students in further sciences and mathematics hands-on learning and career exploration activities in these fields. •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Clemson University, Clemson, South Carolina	100	4 weeks	7, 8	1, 2, 3, 4, 5, 6, 7, 9, 10
Benedict College, Columbia, South Carolina	50	5 weeks	7, 8	1, 2, 4, 5, 6, 7, 8, 9
University of South Carolina, Columbia, South Carolina	44	4 weeks	8, 9	1, 2, 3, 4, 6, 7, 8, 9, 10
Claflin College, Orangeburg, South Carolina	51	3 weeks and 3 days	7, 8, 9	1, 2, 3, 4, 5 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

SCIENTIFIC KNOWLEDGE FOR INDIAN LEARNING AND LEADERSHIP (SKILL) SUMMER MATH & SCIENCE CAMP IN SOUTH DAKOTA

The President of the South Dakota School of Mines and Technology, Richard J. Gowen, states: **"...I write in support of the National Science Foundation Summer Science Camp program held on the South Dakota School of Mines and Technology Campus. With your special support, we have been able to provide opportunities to over 100 American Indian students participating in the Summer Science Camp program.... We are privileged to have 5% of our enrollment that are American Indian students, and we are working to increase this participation further.... We hope that this project continues to be funded by the National Science Foundation."**

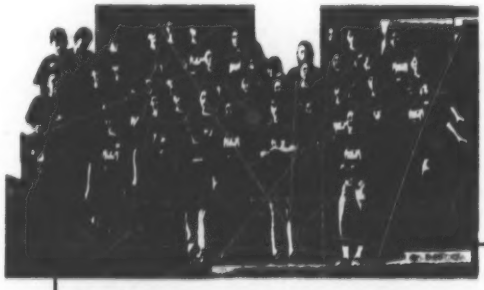
With funds from the **National Science Foundation**, the **"Scientific Knowledge for Indian Learning and Leadership" (SKILL) program at the Dakota School of Mines and Technology (SDSM&T)** has conducted a four-week residential **Summer Math & Science Camp** for 48 American Indian students selected to participate from nine reservations in South Dakota from 1994 to 1996. These 19 boys and 29 girls represent 24 schools ranging from rural reservation schools to urban schools. Many of these schools do not offer math or science instruction beyond the most basic level, and few provide college-level math preparation.

The "Scientific Knowledge for Indian Learning and Leadership" Summer Science Camp provides students with sound instruction in advanced-level mathematics and science, participation in lab and field experiences, and applications of physics principles to familiar objects such as bicycles to help them understand the connections between classroom learning and their own lives.

The primary disciplinary focus of the **curriculum** is on physics. Each student receives a bicycle to conduct numerous problem solving experiments that demonstrate physical principles including angular momentum and mechanical advantage. Other courses include: self-paced mathematics, communication and language skills, studies in Lakota culture and history, computer usage, and geology which leads students to explore and understand the geological features unique to the Black Hills area of South Dakota.

Participants work on research projects with a **staff** of faculty members and research scientists as instructors and mentors. The SKILL Summer Science

> **"...For the majority of students, the program provided exposure to study which is unavailable in their schools...Preliminary test results...show dramatic increases in student achievement in all their classes."**



The happy group of students at the program site, the South Dakota School of Mines and Technology.

Camp program is closely linked to the local student chapter of the American Indian Science and Engineering Society, which provides precollege mentors and role models to the SKILL program participants. These mentors encourage participants to consider careers in science and mathematics, give them the confidence needed to enroll in a mainstream university, enhance participants' continued scientific interest, and encourage them to enter their science projects in the SKILL Summer Science Fair Competition. As a result of the Summer Science Camp, the most outstanding project from this science fair was presented at the National Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C. by program participant *Lee Gerry White* who was awarded first prize for his project from the 1995 Summer Science Camp.

Field trips to various sites of scientific interest, and evening programs such as "Project Wild", sponsored by the Game, Fish and Parks Department, round off the program. **Parents** are strongly encouraged to participate in activities like Family Math, field trips and the graduation ceremony.

Follow-up activities during the academic year include the publication of a bi-monthly newsletter by SKILL students and staff, Saturday seminars, and participants' attendance of the High Plains Regional Science Fair.

Program Director Dr. Phillip J. Huebner states: **"...Post-program tests show an increase in participants' knowledge of science and math concepts...For many, the program changed their self-expressed attitudes toward science, and opened new doors of career opportunities; for the majority it provided exposure to study which is unavailable in their schools...Preliminary results ...show dramatic increases in student achievement in all their classes."**

The impact of the highly successful SKILL Summer Science Camp at the Dakota School of Mines and Technology in South Dakota is recognized by the Vice-President of the College in his letter of endorsement of this National Science Foundation funded program:

SDS M&T Vice President, James R. Goodman, states: **"...the SKILL Summer Science Camp program has introduced students to a curriculum that is not readily available to them in their school districts, including Physics, Computers, Geology and most of all Research and Project development.... We have received numerous compliments from educators across the state as to the positive effect the SKILL Summer Science Camp has had on their students.... The majority of the participants return to their schools in the fall with an established goal, career aspiration and a plan to succeed...We feel that it is extremely important that the National Science Foundation Summer Science Camp program receive future funding. The impact that the program has had on the students involved will stretch out well into their futures."** •

"...We have received numerous compliments from educators across the state as to the positive effect the SKILL Summer Science Camp has had on their students."

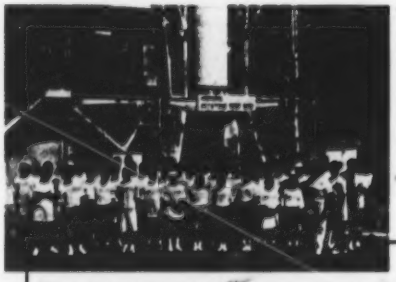
Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
South Dakota School of Mines & Technology, Rapid City, South Dakota	54	4 weeks	8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

UNIVERSITY OF TENNESSEE SUMMER SCIENCE CAMP AT MEMPHIS

Participants of **"The University of Tennessee Memphis Summer Science Camp"**, funded by the **National Science Foundation**, were featured on the local news segment "Health Watch" as they performed self-paced computer-based activities in a laboratory session, and in the newspaper Memphis Commercial Appeal under the headline of "Early Enrichment".



All 50 7th grade participants embark on an educational field trip to the U.S. Space and Rocket Center in Huntsville, Alabama.

The University of Tennessee at Memphis' commuter summer sciences and mathematics enrichment program serves 50 under represented 7th grade students from the Memphis City and Shelby County schools with the **goal** of increasing their mathematical and scientific knowledge and skills. Participants acquire knowledge in algebra and geometry, and learn new science concepts. They are engaged in a series of computer-based activities, interactive physical science experiments; and their awareness of mathematics and science-related career options is increased via role models during this four-week program that seeks to boost these under represented students academically and prepare them for careers in higher education, sciences, and technology.

The mathematics and sciences **curriculum** focuses on learning algebra concepts through the computer-based IBM "Eduquest Algebra Series" software. Unlike most public school classroom settings, participants are presented with a series of interactive physical science experiments that focus on learning-by-doing. They have to acquire physical data on ph-levels, humidity, temperature, and sound of probes in hands-on experimental laboratory situations, and then analyze, store, chart, plot, and save the information with the help of computers. The instructional activities of the program are facilitated by a **staff** of middle and high school teachers, community and business leaders, and undergraduate student mentors. All of them serve as excellent role models for the young participants during the Summer Science Camp.

Field trips to science-related industrial sites, organizations and landmarks provide an outlook into the workplace of successful scientists, and make the students aware of the relevance of science in our lives. A visit to the U.S. Space and Rocket Center in Huntsville, Alabama, enables the participants to explore twenty-first century technology.

Workshops and close interaction with scientists, business people and college faculty provide ample **career exploration opportunities.**

Parents are strongly involved in the program. They attend the orientation meeting in order to receive information on the Summer Science Camp's goals, activities, and benefits. Additional workshops provide information on how parents can support the participants' academic performance and motivation.

Follow-up activities during the academic year focus on sharpening students' reading skills, self-development and health issues impacting on participants' and parents' daily lives. These topics are discussed and presented during the quarterly "Saturday Colloquium".

Eighth grade student Jeshenna Johnson is glad she attended the Summer Science Camp, because **"...The Summer Science Camp at the University of Tennessee, Memphis has enabled me to understand and pass my classes dealing with math and sciences.... As I walk down the halls of Longview Middle School from day to day, I am able to look toward the future..."** •

> "As I walk down the halls of Longview Middle School from day to day, I am able to look toward the future..."

BEST COPY AVAILABLE

SCIENCEQUEST SUMMER SCIENCE CAMP IN TENNESSEE

The four-week residential **Summer Science Camp "ScienceQuest"**, funded by the **National Science Foundation**, with a programmatic focus on life sciences and physical sciences, has been held at **Oak Ridge Associated Universities** from 1993 to 1995 for 60 under represented 7th, 8th and 9th grade students selected annually from schools in East Tennessee.

The **goal** of the program is to generate and maintain an interest in science and mathematics in these under represented students, and to encourage them to consider careers in these fields.

The "ScienceQuest Summer Science Camp" has two major **curriculum** components: life science and physical science. The life science module is field-based with emphasis on environmental concerns. Here, students study water/soil quality and habitat diversity by estimating and measuring insect populations, vegetation, and geological formations. They also investigate waste management techniques. The physical sciences component focuses on robotics and engineering with students testing a variety of robots. **Field trips** to science museums, college campuses, and large processing plants allow the participants to view the actual use of robots and provide career information in the fields of sciences and engineering.

Ultimately, the two major components, life and physical science are integrated, demonstrating the use of robots in environmental studies. "ScienceQuest" also includes a writing component: Each week the students create "The ScienceQuest Student Newsletter", covering the week's news on campus.

Most of the physical and life science activities are carried out outdoors, utilizing the resources of the Oak Ridge National Laboratory, Clinch River Environmental Studies Organization, and local and national Parks.

The "ScienceQuest" Summer Science Camp **staff** consists of college and high school teachers, practicing scientists, mathematicians and high school students who act as role models, too.

Parents and siblings participate during the four-week course of the Summer Science Camp.

The academic year follow-up program enables the students to continue their work on specific science projects in bi-monthly scheduled study workshops. In the 1995 academic year program, the curriculum activities focused on robotics and environmental studies; an exciting visit to the local automotive and chemical plant connected theory with practice. "ScienceQuest" home school teachers monitor the participants' science projects' success, organize the attendance of science fairs and the continuation of the "ScienceQuest Student Newsletter" by using participants' computer knowledge and skills.

> "...Our work with the National Science Foundation on this initiative has been a rewarding experience for both students and teachers...Hopefully, funding will become available to continue this worthwhile effort."

Program Manager Peggy King concludes: **"...Our work with the National Science Foundation on this initiative has been a rewarding experience for both students and teachers...Hopefully, funding will become available to continue this worthwhile effort."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
University of Tennessee, Memphis, Tennessee	50	4 weeks	7	1, 2, 4, 5, 6, 7, 8, 9, 10
Oak Ridge Associated University, Oak Ridge, Tennessee	60	4 weeks	7, 8, 9	1, 2, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

UNIVERSITY OF TEXAS SUMMER SCIENCE CAMP AT AUSTIN

A grant from the **National Science Foundation** from 1992 to 1995 enabled the **University of Texas at Austin** to conduct a Summer Science Camp for a total of 145 under represented participants at **three different sites in the cities of Austin, Dallas, and Mission in Texas.** The three target school districts select participants according to scholastic performance in math and science, interests in math and sciences careers, and recommendations by school teachers.

"...The camps were designed to build a coherent and solid foundation among middle school age students for an interest in and understanding of science and mathematics...," explains *Program Director Dr. Robert Galvan.* The three academically based programs are presented in the context of science related instructional formats with the **purpose** of enhancing the students' academic preparation. The thrust of the **curriculum** at each of the three program sites is for students to obtain understanding of key scientific concepts through a variety of hands-on laboratory experiences. In addition, the mathematics curriculum is integrated to complement the science lessons and activities.

The curriculum for each of the three Summer Science Camps is embodied in a major science-related theme. The themes at three sites are: Water Ecology, Sports in Science, and Rocketry. These themes are based on the environmental resources available in the individual geographic areas, and the nature and interests of the local Summer Science Camp participants.

Students work on sciences research projects related to these themes, interacting closely with active professionals from the fields of science, engineering, and math, who serve as role models and mentors, promote the students' confidence in their abilities to perform well in school, and ultimately encourage them to pursue careers in science, engineering, or math.

Dr. Galvan values the support and funding these successful Summer Science Camps have received from the National Science Foundation: **"...Over a three year period, the University of Texas at Austin/National Science Foundation Summer Science Camp experience provided approximately 450 students with a variety of stimulating and challenging enrichment experiences that assisted them in recognizing not only their potential for succeeding in a University based problem solving endeavor, but also the importance of preparing themselves in order to gain access to higher education."** •

"The camps were designed to build a coherent and solid foundation among middle school age students for an interest in and understanding of science and mathematics..."

BEST COPY AVAILABLE

SUMMER SCIENCE CAMP SMART IN TEXAS

"Careers in Technology" provides opportunities to meet successful women in sciences or mathematics career fields. The goal is to capture and increase girls' interest in these fields.

Girls Incorporated of Metropolitan Dallas' summer science and math enrichment program called "Science, Math and Relevant Technology" or **"Camp SMART"** was funded in 1994 and 1995 by a Dallas area foundation to serve only 14 girls in 1994 and 25 in 1995. For 1996 the program won funding from the **National Science Foundation** to serve 45 under represented girls entering 7th through 9th grade who are members of Girls Incorporated.

The Summer Science Camp **curriculum** is based on the Operation SMART program. Initiated in 1985 by the national organization of Girls Incorporated, Operation SMART (Science, Math and Relevant Technology) supplements the science and math education girls receive in school and encourages them to persist in these subjects.

"Camp SMART" **goals** are: to capture and increase participants' interest in math and science and technological applications of both, to boost awareness of career opportunities in these fields, to provide role models, to improve participants' academic performance, to raise family and community support for the participants to continue their studies in math and science, and to enroll them annually in the "Camp SMART" program.

"Camp SMART" encompasses a broad range of science-related disciplines. Each program week includes classes in mathematics, science, technology, computer studies, and study skills. A daily seminar, "Careers in Technology", gives the female students chances to meet successful women pursuing a variety of careers in science fields. **Field trips** to local businesses and organizations like Infomart, an information marketing center in Dallas, and the Cooper Clinic, a health and fitness research facility in Dallas, offer further career exposure.

"Camp SMART" is a four-week program. "The Math Behind The machine" mathematics class includes problem solving activities and practical applications of mathematical concepts including fractions, proportions, relationships between fractions and decimals, percentages, basic algebraic concepts, and basic geometry. Arithmetic operations with fractions are

girls inc.

BEST COPY AVAILABLE

covered with the participants making their own fraction manipulatives. The construction of a wide variety of graphs includes bar charts, pie charts, and first quadrant co-ordinate graphing. The graphing activities are reinforced in both, the computer and the science class.

The science and technology class utilizes one of the Operation SMART curricula developed by the national organization of Girls Incorporated. The 1996 Summer Science Camp uses the "Simple Machines Curriculum" published in 1994. This curriculum introduces the concept of a simple machine and its use within more complex machines. An early activity includes taking apart a broken machine with an opportunity to use different tools and to closely examine the inner workings of the machine.

Learning to succeed in sciences and mathematics at Girls Incorporated's "Camp Smart" in Dallas is a challenge!

"Camp Smart" encompasses a broad range of science-related topics, including mathematics, science, technology, computer studies, and study skills.

Basic physics concepts such as acceleration are examined. Participants learn measurement techniques, and graph the rate of speed at which an object falls. They build a catapult, work with LEGO's "Dacta Technic" sets, explore wheels, build a winch, explore gears and how they operate on a bicycle. At the end of this class, the female participants design and build their own inventions from everyday materials.

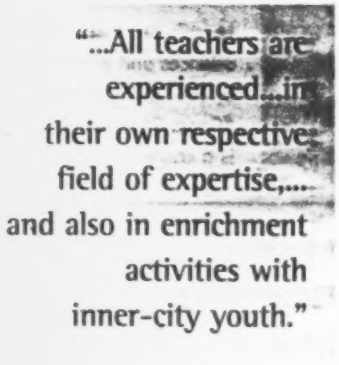
The computer class "Cruising the Internet" provides the participants with an introduction to the use of different software products in order to develop a portfolio describing their Summer Science Camp experiences.

A basic word processing package is covered briefly, with more concentration on a spreadsheet and graphic design package. The spreadsheet package is used to analyze data collected in science class. Graphs are also used to emphasize the relationship between fractions, decimals, and percentages. The participants learn how to construct interfaces between different packages. Finally, the participants learn how to approach a new software package: installation, referencing manuals, following tutorials, and using the new software.

The "Study Skills" class in the morning emphasizes study and organizational skills most useful in technical fields. Outlining, note taking, and goal-setting are covered. Different reading styles required for reading mathematics, or science information are discussed.

A graduation ceremony for students and **parents** ends the summer program, but "Camp SMART" participants and staff continue to meet during the **academic year**. Further exposure to career opportunities is provided, along with academic counseling and science related workshops. •

CAMP YOUTH EXPLORING SCIENCE! (YES!) IN TEXAS


"...All teachers are experienced...in their own respective field of expertise,... and also in enrichment activities with inner-city youth."

For six summer weeks a total of 60 6th through 9th grade under represented students commute to participate in the **"Camp Youth Exploring Science! (YES!)"**, a Summer Science Camp funded by the **National Science Foundation** in 1993 in conjunction with the **Southwest Museum of Science and Technology: "The Science Place"**. The program uses brochures and videos to recruit the 60 students from 20 different schools.

The program **curriculum** emphasizes sciences and computer instruction, scientific research, communication skills, and career opportunities in the field of sciences.

Six scientific teaching modules are developed in the Summer Science Camp: physics, environmental studies, electricity, astronomy, biology and mathematics. Field trips, hands-on and multi-disciplinary approaches make up the instructional framework of this program.

Program Director Lela F. Jackson notes in her reports that: **"...All teachers are experienced ... in their own respective field of expertise, ... and also in enrichment activities with inner-city youth. All staff members are dedicated to cultivating the potential talents of these inner-city students, and to provide them with the skills and background needed to continue to go on to college and a professional career."**

"Camp YES!" is an outstanding example of community collaboration and involvement focused on enabling under represented students to pursue careers in math and science. A few of the supporters of "Camp YES!" include the YMCA of metropolitan Dallas, Exxon, which provides a grant for student internships, the Volunteer Center Dallas, the Black Churches, the Roman Catholic Diocese and the Dallas Independent School District, which provides the classroom facilities, labs and curriculum materials, the National Space Society, and the Dallas Rocket Society.

"Camp Yes!" offers participants integrated, hands-on, and multi-disciplinary learning experiences in mathematics, the sciences, and computer applications. Additionally, the curriculum includes oral and written presentations of project results, and career information sessions by visiting professionals in related technical professions. During the week, students participate in instructional activities with a focus on problem solving and receive a related take-home kit at the end of the week for follow-up at home with family members.

Each 6th and 7th grade student receives a TI-81 calculator, and each 8th grader receives a TI-82 calculator. Students use these calculators in the math classes to solve complex problems, including solving fractions, graphing, expressing scientific notation, and basic algebra.

"Camp YES!" students participate in "Project Ocean" which takes them to the

BEST COPY AVAILABLE

Trinity River to measure salinity, dissolved oxygen and core samples of the river bed, as well as to examine various life species found in the water. Studies include how and why animals live where they do, and the discovery of physical and behavioral adaptions of various species.

An art project takes students back to the ocean as they construct murals and their favorite 3-D animal and plants out of paper mache. Students spend six weeks from 7am to 9am constructing an under-water habitat made of Styrofoam. This habitat is displayed during the scheduled open house for family and friends.

Another Summer Science Camp activity allows participants to explore amusement park physics while designing and constructing their own amusement park rides. Students first take a behind-the-scences tour of "Six Flags Amusement Park", where they discover how rides operate. Then, working in pairs, the students take the information they gained at the amusement park, and begin to design and construct their own rides out of LEGOs. No two groups observe the same ride. Once the rides are constructed, students connect the LEGOs to the computer and operate it at three different speeds. After completing the written, oral, laboratory, and field experience activities, students have a much clearer understanding of the laws and concepts of physics.

In the computer class, participants work in groups of four to create multimedia projects. They are introduced to videotaping, digitizing video, and story boarding, explore the concept of flip charts, and create simple animation.

All staff members are dedicated to cultivating the potential talents of these inner-city students, and to provide them with the skills and background needed to continue to go on to college and a professional career.

Throughout the Summer Science Camp program, students assume the role of engineer, electrician, mathematician, environmental scientist, biologist, physicist, astronaut, and multimedia technician as they rotate through the interactive learning activities.

Each Friday is designated **field trip** day. Students tour "The Science Place" planetarium; they research the stars, galaxies, and movement of planets. A trip to the "World Aquarium" includes a behind-the-scenes tour, discussions with the animal trainers and workers at the facility.

An evening graduation ceremony for staff, students, and **families** concludes the "Camp YES!" Summer Science Camp. A video show featuring camp activities is presented, class projects are displayed, and participants are recognized for their performance during the program.

A positive and lasting impact of the "Camp YES!" Summer Science Camp is measured by the high number of former, older "Camp YES!" participants who return to serve as mentors and role models to the younger students. They also document the program by taking pictures, which are presented to the families and students during the graduation evening, along with achievement awards and student presentations of their special math and sciences projects.

During the academic year, participants' academic progress is tracked, and they are encouraged to keep in close contact with the Southwestern Museum of Sciences & Technology: "The Science Place" by receiving complementary memberships to the museum and serving as volunteers.

Louise Scott, Principal of the D.C. James Learning Center, one of the program's collaborators, attests to the program's positive outcomes: **"...Through 'Camp YES!' The Science Place' is improving the students' educational potential and inspiring middle and high school students, often from under represented ...groups, to enter the fields of science and math."**

One *parent* states that **"...this program has challenged my daughter mentally more than any other school she's been to."** And a *student* explains why: **"...One of the best things about 'Camp YES!' is the dedicated teachers."** •

YES! students investigate physics principles in a field study experiment.

BEST COPY AVAILABLE

SUMMER SCIENCE CAMP AT THE UNIVERSITY OF TEXAS PAN-AMERICAN IN TEXAS

The program provides its participants with opportunities for career exploration by exposing them to successful mathematicians, scientists, and engineers from the community.

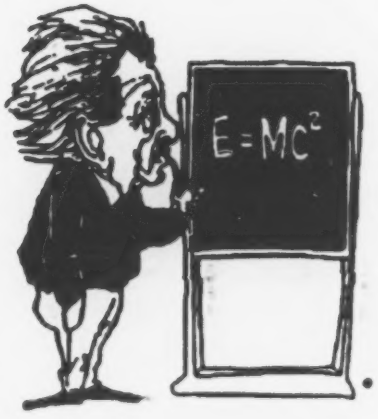
The Summer Science Camp at the University of Texas Pan-American is a collaborative effort of the **National Science Foundation**, the Engineering Department of the University of Texas Pan-American, and the Edinburg Consolidated Independent School District. This commuter program enables 50 under represented students entering 9th grade to participate in practical, everyday mathematics and science activities in 1995.

The program's **goals** are: to steer these students towards science, engineering and math-related careers, to provide them with valuable career information through the use of teacher-role models, mentors, and hands-on sciences, mathematics, and engineering activities, and to challenge them to take as many mathematics and science courses as possible during their high school years. The program also attempts to groom its participants into role models in order to be able to reach a larger group of young people. *The Gifted/Talented Specialist for the Edinburg Consolidated Independent School District, Helen M. Jones,* states that **"...The goals of the program are impressive and evaluations of parents and students indicate that the program exceeded the expectations for the four-week educational experience."**

The Summer Science Camp **curriculum** focuses on how the disciplines of mathematics, chemistry, physics, and introduction to computers are applied to the real world. The math unit focuses on understanding numbers and the significant role they play in our daily lives. The chemistry unit places an emphasis on investigating chemical principles using products people use every day. The physics unit focuses on applying physical principles to the real world using the fields of solar energy and electronics. The instructional activities are scheduled for the morning. During the afternoon, participants engage in research methodology activities, work on student projects, and receive tutoring. Examples of student projects are: assembly of model robots, model bridge building, and model rocketry.

The program provides its participants with opportunities for **career exploration** by exposing them to successful mathematicians, scientists, and engineers from the community, and informing them of the appropriate high school preparation needed in order to pursue an academic career in science-related fields.

BEST COPY AVAILABLE



Educational field trips familiarize students with the applications of scientific concepts in our world, and provide further career exploration. Students visit the U.S. Department of Agriculture Laboratories in Weslaco, TX, tour the Honey Bee Research Laboratory and the non-chemical pest control laboratory. They visit the University of Texas Pan-American's Coastal Studies Laboratory at South Padre Island to learn about marine life in the Gulf of Mexico, and Texas State Technical College's manufacturing, chemical, and electronics technology laboratories.

"...Some students cried on the last day because the camp was over! Students gained confidence in their abilities to be successful in science and math...students were exposed to knowledge and ways of thinking that would not have been available to them at this time, if it were not for this Summer Science Camp."

The Summer Science Camp **staff** includes public school teachers, aided by college and high school student assistants.

A graduation ceremony to honor the participants ends this Summer Science Camp. Again, *Helen M. Jones, Gifted/Talented Specialist for the Edinburg Consolidated Independent School District:* **"...Some students cried on the last day, because the camp was over! Students gained confidence in their abilities to be successful in science and math...Students were exposed to knowledge and ways of thinking that would not have been available to them at this time, if it were not for your Summer Science Camp."**

During the **academic year follow-up activities**, students participate in a science club; their academic success is monitored, they receive additional mentoring support, and tutoring services continue throughout the academic year at the respective high schools.

Program Director Nick Kiritsis describes the program's success by citing participants' post-test results: **"...In general, the participants' interest levels in science, engineering and math related careers were increased ...There was also an increased interest in taking challenging math and science courses in high school."**

One *camp participant, Jessica Cuellar*, was chosen to represent the 1995 Summer Science Camp at the National Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C. with her sciences research project. •

BEST COPY AVAILABLE

BERNARD HARRIS SUMMER SCIENCE CAMP IN TEXAS

The University of Houston named its four-week residential Summer Science Camp for 60 middle school students after the first African-American to walk in space, Dr. Bernard Harris, who is a graduate of the University of Houston.

The program has been funded by the **National Science Foundation** since 1994 and is implemented by the **Marguerite Ross Barnett Bridge Program** at the University of Houston.

The Summer Science Camp seeks to provide under represented students of intermediate academic ability - students who, without strong encouragement, would otherwise not enter a university - with the tools necessary to pursue educational opportunities. The 60 participants are selected from 7th, 8th, and 9th grade in 16 Houston area schools.

The "Bernard Harris Summer Science Camp" **curriculum** focuses on three critical components: Instruction in problem solving in math, chemistry, writing skills, and computer technology; Research in plant biology, engineering design, chemistry projects, and papers on superconductivity; and Career Awareness in the fields of environmental engineering, medicine, technology, and engineering.

BERNARD HARRIS SUMMER SCIENCE CAMP

The Summer Science Camp **staff** comes from the area public schools and collaboratively plans the chemistry, physics, and math classes with faculty from Houston Community College, Northeast College, and the University of Houston. The staff members also serve as mentors to the participants, working with them in classrooms and labs, and on field trips to enhance the students' understanding and knowledge in math and sciences.

"...The program is designed to introduce the participants to exciting career options in science and engineering, through a regimen of classwork, tours of various college campuses and visits with college students and teachers," says *Dr. Abe Bryant, Northeast College's coordinator of math, science, and computer services.*

Field trips to the NASA-Johnson Space Center and the Museum of Natural Sciences enhance students' understanding of the field of science and reinforce their career and academic goals.

A **"Career Day"** is scheduled for Summer Science Camp participants. Guest speakers from Southwestern Bell Telephone, the NASA-Johnson Space Center, and the M. W. Kellog engineering firm attend the Summer Science Camp to provide information about their professions and workplaces. The main feature of the "Career Day" module in the 1995 summer program was the active involvement of Dr. Bernard Harris, whom the Summer Science Camp was named after, and who came to talk to the participants.

The **follow-up activities** of the "Bernard Harris Summer Science Camp" are linked with two outstanding precollege programs: The Marguerite Ross Barnett Bridge Program and the "Can Do Project-Houston." To be enrolled in the Marguerite Ross Barnett Bridge Program participants have to take four years of math and science classes in high school. Hence, the Summer Science Camp participants have a continuum in their math and science education. The "Can Do Project-Houston" is an after-school tutoring program, providing the Summer Science Camp students with continued encouragement and academic help during their school years.

> **"...two-thirds of the participants reported receiving grades of 'A' in their science and math courses..."**

Dr. Jennie Bennett, Principal Investigator of the Summer Science Camp, reports excellent results in a post-program survey. Some of her points are: **"...Approximately two-thirds of the participants reported receiving grades of 'A' in their science and math courses during the regular school year...Students indicated that 'they would try to implement the study skills', and that the 'math activities excited them to learn more math.' ...Students left with an enhanced understanding of science and mathematics."** •

BEST COPY AVAILABLE

HANDS-ON AQUATICS SUMMER SCIENCE CAMP IN TEXAS

Funding from the **National Science Foundation** in 1993 has allowed **Southwest Texas State University** to conduct a residential Summer Science Camp called **"Hands-on Aquatics Summer Science Camp"** serving 50 under represented students from five counties in rural central Texas.

The program **curriculum** emphasizes the interdisciplinary relationships among biology, chemistry, physics, geology, mathematics and computer science through carefully selected field and laboratory experiments and observations focusing on the freshwater environment of the nationally acclaimed San Marcos River.

This program is funded in part by the **National Science Foundation** and facilitated by the **Edward Aquifer Research and Data Center.**

The Edwards Aquifer is the sole source drinking water supply for San Antonio and the Austin-San Antonio corridor, a unique carbonate aquifer made up of porous, permeable limestone. Springs from the Edwards Aquifer feed several rivers and support the habitat of endangered species. It is vital to the agricultural, recreational and industrial economy of the region.

The Summer Science Program is **staffed** by local public school teachers, college faculty and students, and practicing scientists. The staff not only facilitates the hands-on experiments and other instructional activities, like the collection and testing of water samples regarding carbonate ions, nitrates, phosphates, oxygen, and ph-levels; it also provides participants with math and sciences career counseling workshops in math and sciences and role model interaction.

One teacher, Evelyn Barrett, describes her program work as follows: **"...I taught water chemistry for 90 minutes every day and these kids worked hard. We learned a lot about the Edwards Aquifer water characteristics and studied a spring-fed river. With Hatch test kits, I was able to take the kids outdoors and give them hands-on experience running the same tests professionals use."**

> "They were wonderful students! These young people were very enthusiastic and involved..."

The *Program Director* sums up the experiences with the Summer Science Camp: **"...They were wonderful students.... These young people were very enthusiastic and involved - they learned about the aquifer, ground water, water sampling, collecting plant and animal specimens from the San Marcos River, and identifying invertebrate species microscopically. We look forward to having another group next summer!"** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
University of Texas at Austin, Austin, Texas	145	4 weeks	8, 9	1, 2, 3, 4, 5, 7,
Girls, Inc. Metropolitan, Dallas, Texas	24	4 weeks	7, 8, 9	1, 2, 3, 4, 5, 7, 8, 9, 10
The Science Place Fair Park, Dallas, Texas	60	6 weeks	6, 7, 8, 9	1, 2, 4, 6, 7, 8, 9, 10
University of Texas Pan American, Edinburg, Texas	49	4 weeks	9	1, 2, 3, 4, 5 6, 7, 8, 9
University of Houston, Houston, Texas	60	4 weeks	7, 8, 9	1, 2, 3, 4, 6, 7, 8, 9
Southwest Texas State University, San Marcos, Texas	50	4 weeks	7	1, 2, 4, 5, 6, 7, 8

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

187
BEST COPY AVAILABLE

HAMPTON UNIVERSITY'S SUMMER SCIENCE CAMP IN MATHEMATICS AND SCIENCE IN VIRGINIA

"...Fortunately or unfortunately, the youths are the ones ushering and introducing technology to our older generation...."

Internet and World Wide Web have been introduced at **Hampton University's** four-week **National Science Foundation** funded commuter Summer Science Camp for approximately 100 under represented 7th grade students from 1993 to 1995.

The program introduces these students to different aspects of science. It is also designed to improve their mathematics skills and provides them with career options in the field of sciences.

The program's mathematics **curriculum** includes classes in geometry, probability, and statistics, the use of graphic calculators, an introduction to IBM and Macintosh computers with challenging mathematics software, and an introduction to the Internet. These classes are held three times a week; Wednesdays are used for mathematics and sciences related field trips; and on Fridays, career exploration sessions are held with guest speakers providing information on careers in mathematics and sciences fields to the participants.

In geometry class, students are introduced to the use of the protractor and the compass. They use geometric models in hands-on activities; and manipulatives such as pattern blocks, attribute blocks, and the geoboard are utilized in the learning activities. Students compare area to volume and develop formulas through research, rather than memorization. Visuals, along with cooperative learning play a key role in the geometry module.

Probability classes allow students to understand the concept of chance. They use the State's lottery information to determine the chance of winning first, second, and third prize. Participants investigate what determines the probability of winning.

Statistics classes focus on knowing the mean, median, and mode. Students are introduced to data collection, analysis, and usefulness. They are given the opportunity to conduct their own survey and to display the charted results on campus.

One *parent* states: **"...Fortunately or unfortunately, the youths are the ones ushering and introducing technology to our older generation. ... Right now, Lawrence knows more about the Information Highway than anyone in our household, and I am sure he will teach us to 'surf the Net' once we are on line. ... I would also like to express my appreciation for the foresight of the National Science Foundation in funding such a worthwhile project."**

The **staff** includes college professors, high and middle school teachers, and college students serving as teaching assistants and role models for the participants.

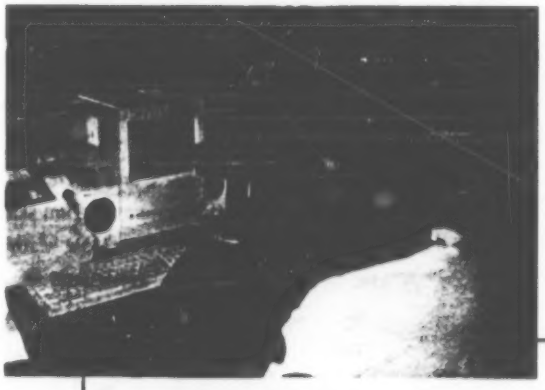
The graduation ceremony is not only an example of the the program's success in positively impacting the participants' academic skills and interests in mathematics and computer sciences; it also proves how the camp fosters close personal relationships among participants, staff, and parents, along with boosting the students' self-esteem.

Parents are highly involved and invited to participate in Summer Science Camp's activities and **field trips**, for example, to the Virginia Air and Space Museum, the Richmond Science and Technology Museum, and other sites of scientific interest.

The graduation ceremony at the end of the Summer Science Camp is not only an example of the the program's success in positively impacting the participants' academic skills and interests in mathematics and computer sciences; it also proves how the camp fosters close personal relationships among participants, staff, and parents, along with boosting the students' self-esteem.

A variety of **follow-up activities**, such as students' presentations of newly acquired math and sciences skills, are carried on into the classroom during the school year.

Program Director Dr. Ann E. Trahanovsky-Orletsky sums up her three-year involvement with the Summer Science Camp at Hampton University: **"...This (1995) was the final year funded by the National Science Foundation. It was the second year that support was received from the "Continuous Electron Beam Accelerator Facility" (CEBAF), an outside organization....Programs like the Summer Science Camp are not built overnight but must develop and grow.... I would like to thank the National Science Foundation for the opportunity it provided to the community of Hampton University, and CEBAF for its supportive role in this achievement. Well over 500 individuals involved in this program for three years benefited and grew in their education, their careers, their community, and their worth..."** •



A group of 7th grade students actively engaged in a discussion concerning the Internet and World Wide Web.

BEST COPY AVAILABLE

AFRICAN-AMERICAN MALE IN MATH AND SCIENCE ACADEMY IN VIRGINIA

Communication skills are taught through instruction, research reports, and presentations, all built around the scientific research process.

"CHROME: Cooperating Hampton Roads Organizations for Minorities In Engineering", a collaborative partnership in southeastern Virginia, operates a **National Science Foundation** funded commuter Summer Science Camp in 1996 called **"The African-American Male in Math and Science Academy" (AAMMSA)** for 67 under represented 7th and 8th grade male students from four urban school districts in Hampton Roads. The program is held at **three sites: Hampton University, Norfolk State University, and Old Dominion University.**

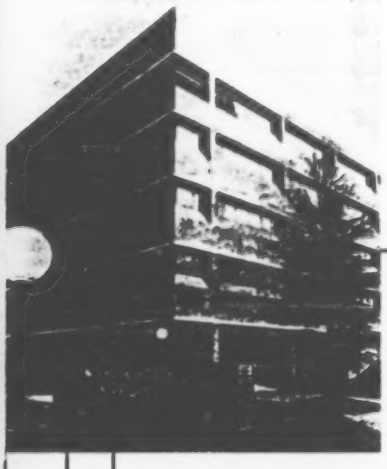
The **goal** of the program is to identify, nurture, and assist these participants to pursue careers in engineering, science, and mathematics-related fields. The Summer Science Camp attempts to stimulate more positive attitudes and career awareness in these fields, encouraging students to complete high school, preparing them for advanced-level science and math courses, and improving their scientific and communication skills.

The "African-American Male Math and Science Academy" **curriculum** is developed around four areas: 1) Mathematics, with emphasis on building strong skills in algebra; 2) Science, with emphasis on physical sciences and the research process; 3) Written and Oral Communication Skills; and 4) Technology, with an emphasis on the use of graphic calculators and computer applications. The main teaching strategy reflects the experiential learning cycle: problem solving and critical thinking skills. Students are involved in challenging daily mathematics activities and drills to solidify knowledge for algebra. Biweekly hands-on lab sessions are scheduled for the participants with professors from the host universities. Communication skills are taught through instruction, research reports, and presentations built around the scientific research process.

To ground the curriculum in additional real life applications, students take several **field trips** to local and regional learning sites: the Baltimore Aquarium and Science Museum, Siemens Automotive, and others.

During the **academic year**, students receive extensive academic enrichment and support through high school via the very effective network of school-based CHROME clubs, and other educational follow-up programs.

The "African-American Male in Math and Science Academy" is an integral part of a broad and remarkably effective regional initiative which has been promoting under represented students' participation in science, math, and engineering for eleven years! •



Norfolk State University is one of three program sites for the "African-American Male in Math and Science Academy," a Summer Science Camp organized by "Chrome: Cooperating Hampton Roads Organizations for Minorities in Engineering."

BEST COPY AVAILABLE

NORFOLK STATE UNIVERSITY SUMMER SCIENCE CAMP IN VIRGINIA

The **National Science Foundation** awarded funding to **Norfolk State University** for setting up a **Summer Science Camp** program in the summer of 1996, serving 50 under represented 7th grade students selected from sixteen schools throughout the Tidewater and Peninsula areas of Virginia to participate in a four-week commuter math and science enrichment and enhancement program at Norfolk State University.

The "Norfolk State University Summer Science Camp's" has eight **objectives:** 1) to expose the participating middle school students to mathematics and science applications in a mathematical modeling, project-oriented environment; 2) to give instruction in the use of graphing calculators and personal computers; 3) to provide hands-on laboratory activities in Biology, Chemistry, and Mathematics; 4) to afford students the opportunity to interact with practicing mathematicians and scientists through various lectures and demonstrations; 5) to provide field trips to local science-related museums and attractions for observation of mathematics and science in action; 6) to provide opportunities for career exploration through participation in the program "Realizing the Dream: Career Planning for the 21st Century"; 7) to lend assistance to students throughout the academic year in the review of courses and/or activities appropriate for mathematics and sciences careers; and 8) to increase participants' confidence and ability in mathematics and sciences to consider careers in these fields as real possibilities.

This Summer Science Camp's **curriculum** integrates sciences, mathematics, and technology, and is modeled around the theme "Career Models - Mathematics, Science and Technology". All learning activities occur in an exciting environment helping students to develop mathematics, science, and writing skills via laboratory projects supported by calculator and computer technology. The attendants conduct general biology and chemistry investigations, and use mathematical models to analyze the generated data. They discover new reasoning processes, solve questions in cooperative groups, and are encouraged to make connections between the classroom and the real world of mathematics and sciences. Each student works on an individual science research project to be presented at the end of the Summer Science Camp program.

> The Camp provides an opportunity to impact students very early in the education process, to show them the benefits of a science career and to convince them of their capability to excel in mathematics and science.

The sciences module encompasses biology and chemistry. In biology, students investigate bacteria, their growth, impact and destruction, and embark on a computer search on the Internet regarding this subject. In chemistry, the participants are involved in activities focusing on density, chemical reaction, and weighing, aided by laboratory experiments and calculator analysis. The mathematics module uses a MESA series developed to allow students to explore the mathematics and science of selected careers. Participants learn, for example, to measure earthquakes and movements, and to classify fingerprints. The mathematics component centers on pre-algebra topics like ratio, proportion, binary and decimal number systems, estimation logarithmic scales, and many others. Each Friday is Technology Day. The technology module introduces the participants to the use of the TI-82 calculator and the personal computer. The calculator activities focus on number crunching and pattern recognition, programming, and data analysis. Computer laboratory activities include learning the basic skills of word processing, spreadsheets, desktop publishing, and research on the Internet. The "Career Exploration" module, called "Realizing the Dream: Career Planning for the 21st Century", involves the attendants in activities like: "Development of Self-Concept through Steps to Your Goal," "You and the World of Occupations,"

and "Career Research via the Computer". Guest speakers from various fields of sciences and mathematics come to the "Norfolk State University Summer science Camp" to share information about their careers and work with the young students.

A variety of **field trips** are scheduled for the students; they visit the Planetarium at Norfolk State University, the Virginia Marine Science Museum, the Virginia Air and Space Museum, and "Nauticus".

Academic year follow-up activities center on high school and college preparation via tutorials and mathematics and sciences enrichment activities. **Parents** are encouraged to attend the college planning sessions along with their children.

Dr. Philip McNeil, Chairman of Norfolk State University's Mathematics Department believes that **"...the Summer Science Camp provides an opportunity ...to impact students very early in the education process, to show them the benefits of a science career and to convince them of their capability to excel in mathematics and science."** *Graduate student assistants* comment on the benefits of the Summer Science Camp for the participants and themselves. *Carla Toomer, a senior in mathematics/education at Norfolk State University* states: **"...The program has enhanced the students' knowledge about math and science. It has also enhanced my knowledge of teaching strategies ..."** Two weeks into the first 1996 Summer Science Camp program students are excited and grateful for having the opportunity to participate. *Dominique* states: **"...On Technology Day we went on the Internet, wrote on WordPerfect and worked on calculators. I think Technology is the best day of the week."** *Parent Robin Patrick* writes: **"...The Science Camp has been an excellent learning experience for my child. The camp exposed my child to leading scientists in a university setting, provided hands-on teaching and reinforcement of concepts taught during the school year. It is also a wonderful way to increase socialization skills through cooperative learning and group projects. I have been impressed with the outstanding work of the camp staff and am hopeful that Norfolk State University continues with this needed camp."** •

> One parent writes: "...The Science Camp has been an excellent learning experience for my child.... It is a wonderful way to increase socialization skills through cooperative learning and group projects...."

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Hampton University, Hampton, Virginia	100	4 weeks	7	1, 2, 4, 6, 8, 9, 10
Old Dominion University, Norfolk, Virginia	67	4 weeks	7, 8	1, 2, 3, 4, 5, 7, 9
Norfolk State University, Norfolk, Virginia	50	4 weeks	7	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

THE BIOSPHERE OF TOMORROW
SUMMER SCIENCE CAMP IN WASHINGTON STATE

"**The Biosphere of Tomorrow**" 1995 Summer Science Camp has been featured several times in local newspapers for its outstanding success in servicing the Seattle community. The four-week commuter program was funded by the **National Science Foundation** with support from the **Seattle Central Community College,** the Greater Seattle Chamber of Commerce, and the Breakfast Club, a Seattle organization of prominent black business and professional men, in conjunction with Seattle area businesses, Boeing Co., Washington Mutual Savings Bank, US West Communications, and the Bon Marche.

The "Biosphere of Tomorrow" Summer Science Camp program serves 75 under represented middle school students recruited from the Seattle area with the assistance of counselors, teachers, community organizations, case workers, churches, and parents. The 75 "Biosphere" students in the 1995 Summer Science Camp program represented six different cultural groups.

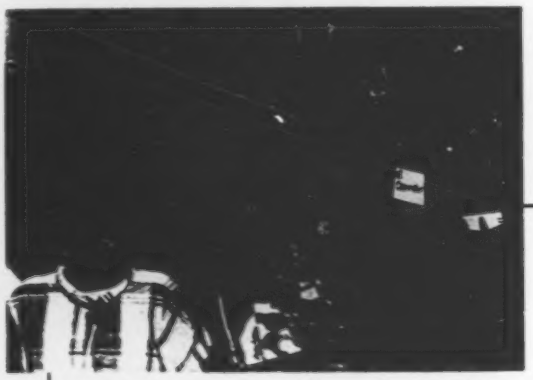
Program Director Teresa Tipton states the program's **goal**: to motivate underachieving students at an early age to pursue science, math, and technology studies as they continue in school.

Outdoor environmental classes allow students to gather data on trees and plants.

"The Biosphere of Tomorrow" Summer Science Camp **curriculum** requires participants to be split in three groups and rotated through three academic components: I) biology/chemistry, II) mathematics/computers, and III) environmental education. Classes in each of these components are conducted three days each week on the Seattle Central Community College campus.

Environmental courses are taught mostly at outdoor locations. The students visit the Woodland Park Zoo to study insects, plants, and trees. At the Discovery Park, they learn more about animals.

Mathematics and computer introduction are taught on Monday mornings; in the afternoon, students have to work on measurement problems, for example, trying to figure out what the average Biosphere student looks like. Results have to be recorded on a spreadsheet. In



An intense mathematics session conducted during "Seattle Central Community College's Summer Science Camp."

combination with these instructional mathematical tasks, students learn how to use e-mail.

Biology and chemistry instructional activities focus on learning to build rocket cars. An educational **field trip** to the Burke Museum and to the University of Washington Nursery allows the attendants to receive information on different types of plants, and to gain hands-on science experience, like for example dissecting a cow eye.

Environmental classes are mostly taught at outdoor locations. The students visit the Woodland Park Zoo and Carkeek Park to study insects, plants and trees. At the Discovery Park, they learn more about animals. Each trip encourages them to consider careers in biotechnology, environmental sciences, engineering, and related fields.

The program's **staff** includes faculty members and college students who major in science as teaching assistants. Members from the community work as mentors with the participants during the summer science program.

"The Biosphere of Tomorrow" program requires that each student secures the volunteer support of at least one adult, preferably a family member, for two hours of the Summer Science Camp program. These adults have the option to chaperone on a field trip, to assist in the office or in a class.

The four week program culminates with a festive graduation ceremony attended by faculty, participants, friends, and family, where students display their science research projects.

It was a special event when 1995 Summer Science Camp participant *Gaynell Walker* and her mother were awarded the honor to travel to the National Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C., to display her Summer Science Camp project as a representation of "The Biosphere of Tomorrow" Summer Science Camp program.

Participants are provided with additional academic support and career counseling during the **academic year follow-up program.**

Seattle Central Community College President Charles Mitchell says: **"...For some, there's a fear that they can't compete in math or science...We wanted to show them that these are user-friendly subjects. We want them to feel high self-esteem."** •

"...For some, there's a fear that they can't compete in math or science...We wanted to show them that these are user-friendly subjects. We want them to feel high self-esteem."

BEST COPY AVAILABLE

SCIENCE SPLASH! SUMMER SCIENCE CAMP IN WASHINGTON STATE

From 1993 to 1995 the **National Science Foundation** has enabled over 150 under represented girls to participate in a four-week residential and commuter **"Science Splash!"** Summer Science Camp before and during their 8th grade year. The program selects students who are able and motivated, but who might lose interest in science and mathematics without special attention.

The program's **goals** are: to expose its participants to the excitement of the process of science, engineering and mathematics, to inform them about a wide variety of math and sciences career options, to encourage them to pursue rigorous math and science training in high school, and to begin considering options for scientific education at the university level.

> "This society does not, unfortunately, treat all of its people equally. It takes brains, heart, and courage to make it..."Splash" offers young...women not only skills in science, but also nurtures self-esteem, friendship and the confidence to think for oneself."

Heritage College, located on the Yakima Indian Reservation in Toppenish, and **Seattle University**, located in downtown Seattle, jointly conduct this highly interactive program focusing the **curriculum** on the physics of water and water quality issues. The KCM Watershed Management Group provides professional mentorship, technical assistance, transportation, and equipment for the program.

During the first three weeks, activities are conducted concurrently on the two campuses. Topics include: fluid flows, waves, water quality and quantity. Working in small groups, participants undertake hands-on activities and experiments, supplemented by **field trips.** Attendants use word processing and spreadsheets to record their results, and are introduced to the World Wide Web. During the fourth week, the students join forces at a residential lakeside science camp, where they con-

A "Science Splash!" Summer Science Camp participant receives hands-on experiences in monitoring water quality.

BEST COPY AVAILABLE

1994 "Science Splash!" participant Felicia Colon-Barnes receives the Precollege Research Award at the NSF's Third Annual Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C.

duct lake monitoring activities. Here, they are introduced to the use of graphic calculators and sketch pads.

This Summer Science Camp has generated considerable interest in the press and on local television. Participants presented their projects on "Eye on Science", a local TV program on science, and two groups of students were featured on public television. The *host of "Eye on Science", Belinda Chin*, says about "Science Splash!": **"...As a first generation Asian American woman, I can attest that this society does not, unfortunately, treat all of its people equally. It takes brains, heart and courage to make it.... 'Splash' offers young ...women not only skills in science, but also nurtures self-esteem, friendship, and the confidence to think for one's self. I hope that this excellent program has a long prosperous life so that many generations of young women ...can continue to be inspired by it."**

During the **academic year** the students form teams to work on a science project with the help of a professional mentor and a Seattle University student. The students are required to write a contract which describes their project, the timeline they will follow, and what supplies they will need; they also write mid-project and final reports.The project results are presented to peers, **parents** and staff at the final "Science Celebration."

University of Washington History Professor Dr. Erasmo Gamboa , who is also the parent of a "Science Splash!" participant, stresses the program's benefits for his daughter: **"...Coming at the time when she was ready to transition to high school, the 'Science Splash!' program challenged and motivated Andrea to learn about scientific research techniques, analysis and presentation of outcomes...the importance of making a sincere commitment to a long-term research project...From another perspective, your program is critical to expanding the horizon of promising young ...women. I can not think of another local program that provides ...the opportunity to do scientific work with exemplary university faculty.... Many of these young students will emulate the positive role models provided by 'Science Splash!'. I applaud the outstanding mentoring service you are providing...!"**

The program received the Gordie Hamilton Award from the American Camping Association in recognition of its creative approach to science learning.

In 1994, 8th grader *Felicia Colon-Barnes* was presented with a Precollege Research Award at the Third Annual Conference on Diversity in the Scientific and Technological Workforce in Washington, D.C. for her aerodynamics project. Felicia's team was assisted by Boeing personnel. She was able to discuss her work with other students in the National Science Foundation funded interactive video broadcast 'Project PROMMISE' in 1995.

Project Director Sister Kathleen Sullivan concludes on the success of the "Science Splash!" Summer Science Camp by writing: **"...When the program evaluator asked the students which of the goals of 'Splash!' were most important to them, they ranked increasing science knowledge first, being exposed to the culture and methods of science second, and developing the ability to describe scientific finding came third."** •

BEST COPY AVAILABLE

TECHNOLOGY SUMMER SCIENCE CAMP IN WASHINGTON

The **University of Washington** in Seattle has conducted a four-week residential **"Technology Summer Camp"** funded by the **National Science Foundation** from 1993 to 1995 for 25 under represented 8th grade students.

The program's **goal** is to provide a positive environment for learning, and to create projects and activities relevant to current social and environmental issues. Students are introduced to career opportunities in the fields of science, engineering and mathematics, and the program reinforces their creativity in the process of scientific discovery. Long-term goals of the project are: to increase the number of under represented students in sciences, to generate scholars in the field of science, engineering and mathematics, and to join efforts in the educational reform underway at the University of Washington's School of Engineering in bringing together young students and teachers that have historically been excluded from science and engineering.

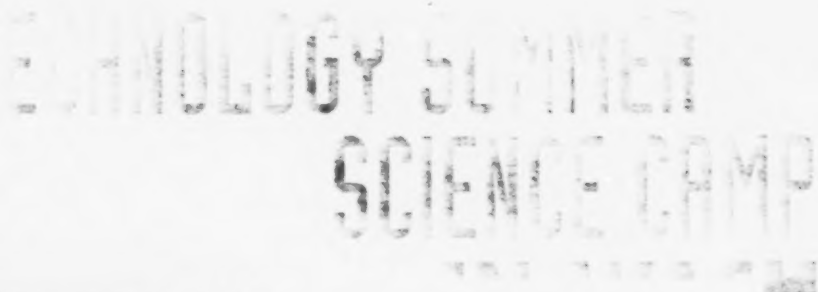
The disciplinary focus of this Summer Science Camp's **curriculum** is environmental and technological. It introduces math and sciences as they relate to engineering. The curriculum activities are planned around four thematic units: Urban, Marine, Global and Forest/Wetlands Environments.

Urban Environment includes: making a battery, self-contained vehicle design, creating a temperature and light probe, and other hands-on sciences projects by the students. Forest Wetlands Environment focuses on six days of forestry field work at the Pack Forest Research Station. Marine Environment centers around a trip to the Wolf Hollow Rehabilitation Center, an oyster farm, and whale watching – all excellent opportunities to explore marine sciences. Global Environment focuses on an introduction to telecommunications, a virtual reality lab, paper recycling, and a visit to the Medicinal Herbal Garden. The students' ratings of classroom activities show as the highest rated activity by both male and female students "telecommunications". Students consider "designing and testing the self-powered vehicles" as the most challenging activity.

> "...Much of our staff is comprised of past Camp participants...we are providing opportunities beyond the Camp itself ...In many ways we ...provide our participants with real opportunities for future success."

A special feature of this "Technology Summer Camp" is the collaboration and teamwork of University **staff**, high school teachers, industrial representatives, graduate and undergraduate students from the University of Washington Education and Engineering Departments, and previous summer program participants who now attend

BEST COPY AVAILABLE



"I enjoyed just about everything,...the overall experience, and the information I received about technology. The Summer Science Camp helps me with my school work."

high school; all of them teach, mentor, and serve as role models for the 25 summer program participants!

Project Coordinator Robin Adams describes the program's staff and its impact: **"...much of our staff is comprised of past Camp participants...we are providing opportunities beyond the Camp itself ...In many ways we ...provide our participants with real opportunities for future success."**

The "Technology Summer Science Camp" holds a **career exploration** Engineering and Science Fair with the help of members of scientific national organizations for the advancement of under represented people like the American Indian Science and Engineering Society, faculty and students from the University of Washington, the Boeing Company, and other industrial organizations, providing career information, and opportunities to speak to the Summer Science Camp participants.

Field trips to the Pack Forest Research Station (Mt. Rainier/Mt. St. Helens) and the Northwest Center for Environmental Education (Friday Harbor, San Juan Islands) add excitement and joy!

The Summer Science Camp has strong community partnerships. The Boeing company sponsors **"Project Compute"**, hiring high school participants as supportive staff for the "Technology Summer Science Camp". **MESA** teachers become involved in assisting with the participants' science research projects.

Parents attend the "Technology Summer Science Camp" orientation activities and "Camp BBQ", where they are provided with information on educational opportunities in sciences and math for their children.

During the **academic year follow-up program** the multidisciplinary and collaborative teamwork effort continues to provide unique learning experiences.

One participant writes: **"...I enjoyed just about everything; ...the overall experience, and the information I received about technology. The Summer Science Camp helps me with my school work."** •

Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
Seattle Central Community College, Seattle, Washington	75	2 weeks	6, 7, 8	1, 3, 5, 6, 8, 9, 10
Seattle University, Seattle, Washington	50	4 weeks	8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
University of Washington, Seattle, Washington	25	4 weeks	8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

METEKUKUKIAH PEMAENAKUAQ OR KEEPERS OF THE FOREST SUMMER SCIENCE CAMP IN WISCONSIN

The **National Science Foundation** is funding a six-week 1996 Summer Science Camp **on the Menominee Reservation** for 7th through 9th grade Native American students called: **"Metekukukiah Pemaenakuaq"** or **"Keepers of the Forest."** This program proposes an experiential field-based approach and many unique opportunities for the Menominee youth participants to learn mathematics and science in the context of forestry. Native American culture and traditions related to forest management are a major focus in this Summer Science Camp **curriculum.**

Students learn in mentorship situations about the annual allowable amount of timber harvested and the measurements used to calculate it; they measure trees for their research projects, and learn how to use forestry tools and methods that have made the Menominee forests world-famous. All of these outdoor field activities are taught by forestry professionals and Native American community elders.

Menominee Tribal Enterprises President Lawrence Waukau states that **"...the Menominee have an international reputation for quality forest management.... The education of our youth begins the perpetuation of our unique philosophy, and the National Science Foundation Summer Science Camp will be a direct hands-on demonstration of our commitment.... In spite of a forest-based economy that has been operating for over 100 years, there is a lack of college educated tribal members. By providing students with direct experience in forest management practices and principles here on the Menominee Reservation, this National Science Foundation Summer Science Camp will demonstrate to students the relevance of science to their lives and the success of the Tribe."**

"By providing students with direct experience in forest management practices and principles here on the Menominee Reservation, this NSF Summer Science Camp will demonstrate to students the relevance of science to their lives and the success of the Tribe."

Staff from the College of the Menominee Nation and the University of Wisconsin at Stevens Point work closely together to heighten the students' awareness of educational opportunities in sciences and math, and the academic preparation necessary for those careers. Community support is strong.

Follow-up activities during the academic year are designed to provide hands-on experiences in forestry workshops, and further career exploration opportunities. Students school attendance, course selection, and academic performance are monitored. •

BEST COPY AVAILABLE

YOUNG ENGINEERING AND SCIENCE SCHOLARS [YESS] IN WISCONSIN

"During the Summer Science Camp, students are encouraged to practice higher order thinking skills and to participate as part of a production team. Both of these skills translate into classroom success!"

A unique curriculum blending engineering, sciences and mathematics activities allows participants of **Marquette University's Summer Science Camp, the "Young Engineering and Science Scholars" (YESS)**, to engage in innovative engineering problem-solving activities: Students build small solar powered boats and race them, and construct small computer-controlled machines to engage in a contest of lifting objects. These challenging engineering projects developed by the Summer Science Camp participants with the assistance of the staff caught the attention of the local TV channel news in the "Young Engineering and Science Scholars" Summer Science Camp's third year, 1995, and the local Milwaukee Journal Sentinel published a feature article on the "YESS" Summer Science Camp's success for the general community as well.

The National Science Foundation sponsors this four-week commuter Summer Science Camp in collaboration with Marquette University's College Department of Electrical and Computer Engineering, its Educational Opportunity Program, and the General Electric Foundation, allowing 52 under represented 7th and 8th grade students from Milwaukee area public schools to attend this engineering and science enrichment Summer Science Camp program from 1993 to 1996.

MARQUETTE UNIVERSITY

The "YESS" program's **goals** are: to increase student understanding of the importance of the sciences, mathematics, and communication skills in their daily living, to strengthen their commitment to remain in school, to encourage them to continue the study of science and math, to become familiarized with the career opportunities in math and science, and to provide the academic preparation necessary for success in high school.

The "Young Engineering and Science Scholars" **(YESS) staff** consists of engineering faculty from Marquette University, middle school teachers, and undergraduate students; all working together to familiarize students with the career exploration process and academic preparation in math and sciences.

Laboratory notebook, creativity sessions, research presentations, Internet introduction, engineering ethics discussions, individual research projects, greenhouse project, the robotic arm project, and recreational activities form part of the **curriculum** offered to students during the four program weeks. "The Wonderful World of Robotics" teaching unit involves participants in exploring robotics

through hands-on discoveries and demonstrations in civil, mechanical, electrical and computer engineering.

Evaluations of participants' skills and acquisition of science and math concepts indicate, for example, that students understood the importance of keeping a laboratory notebook and the value of note taking skills in order to successfully master their science projects.

Field trips to local industries help to reinforce the program activities and connect them with the real world practice. Students tour the automated manufacturing division at Allen-Bradley industries, the General Motors Truck Plant in Janesville, Wisconsin, and the "Discovery World Museum of Science and Technology" in Milwaukee, Wisconsin.

A **'Parents Day'** allows participants to proudly share their accomplishments.

Milwaukee middle school science teacher Erin K. Walsh attests to the program's success: **"...I would like to express my support for Marquette University's Summer Science Camp 'YESS'. It is a valuable experience for students, motivating them to perform better in school and stimulating a continuous interest in science. During the Summer Science Camp, they are encouraged to practice higher order thinking skills and to participate as part of a production team. Both of these skills translate into classroom success!"**

Follow-up activities during the academic year continue on Saturdays in "Olin Engineering" at Marquette University for further experimentation and instruction in science, engineering, and math in the "Saturday Science Colloquia". Students enroll in Science Clubs in their respective home schools, and receive assistance with their research projects in order to enter them in the Marquette University Science Fair.

Program Director Dr. Susan C. Schneider sums up the program's success: **"...The YESS student retention rate at the Summer Science Camp has been 100%...during the academic year Saturday follow-up activities has been 84%."**

The mother of Myrna Schimenz agrees: **"...the Summer Science Camp...is one program that my entire family feels is something that our young children need. Without this type of program, she and other young students ...would not get the opportunities to be involved and excited in science. These kids need early intervention if we want them to consider any type of science field in the future. If they are not hooked early, we will lose some of our greatest potential."**

Summer Science Camp "YESS" participants at Marquette University.

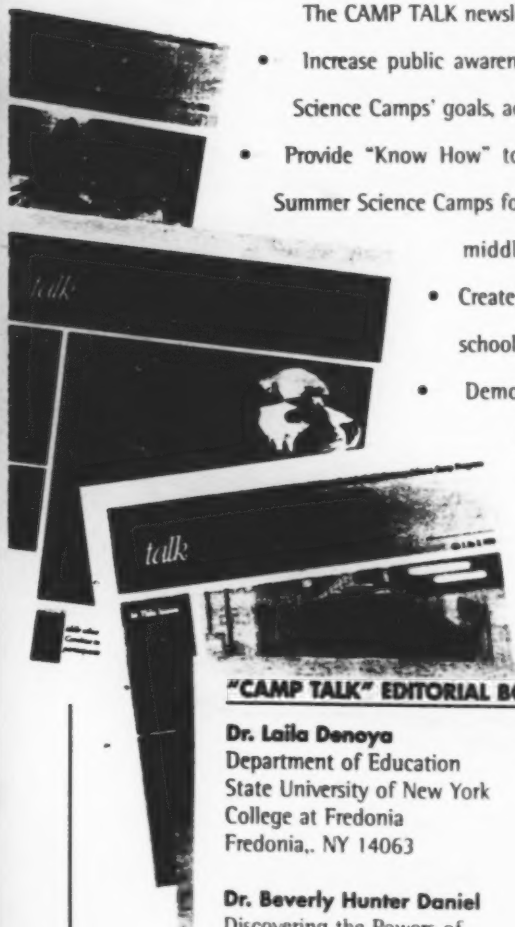
Summer Science Camp	Number of Participants	Program Length	Grade Levels	Activities
College of the Menominee Nation, Keshena/Neopit, Wisconsin	50	6 weeks	7, 8, 9	1, 2, 3, 4, 5, 7, 8, 9
Marquette University, Milwaukee, Wisconsin	52	4 weeks	6, 7, 8	1, 2, 3, 4, 6, 8, 9, 10

Program Activities: Academic Enrichment: 1; Academic Skills Improvement: 2; Academic Counseling: 3; Career Counseling: 4; Faculty Mentoring: 5; Student Mentoring: 6; Research: 7; Field Trips: 8; Follow-up Activities: 9; Parental Involvement: 10.

BEST COPY AVAILABLE

COMMUNICATING WITH "CAMP TALK," THE NATIONAL SCIENCE FOUNDATION/ SUMMER SCIENCE CAMP NEWSLETTER!

In 1993, a team of Summer Science Camp principal investigators formed a collaborative editorial board to conceive a newsletter, "CAMP TALK", focusing on the program activities and outcomes achieved in each Summer Science Camp program.



The CAMP TALK newsletter served to:

- Increase public awareness of the Summer Science Camps' goals, activities and results.
- Provide "Know How" to launch successful Summer Science Camps for under represented middle school students.
- Create linkages to parents, schools and communities.
- Demonstrate successful allocation of funding into the much needed Summer Science Camps for underpriviledged students.
- Give positive tone of students' academic performance, with a strong commitment in the fields of sciences and mathematics.
- Exhibit the strong commitment of the Summer Science Camps' staff in assisting the students to remain in school and succeed in mathematics, sciences, and communication skills.
- Advocate the effects of individuals who are convinced about how to break ranks with traditional ways of operating knowledge in mathematics and the sciences for students.

"CAMP TALK" EDITORIAL BOARD

Dr. Laila Denoya
Department of Education
State University of New York
College at Fredonia
Fredonia,. NY 14063

Dr. Beverly Hunter Daniel
Discovering the Powers of
Mathematics, Science, and
Engineering, Inc.
West Hartford, CT 06119

Dr. Iris DeLoach Johnson
Teacher Education Department
Miami University at Oxford
Oxford, OH 45056

Dr. Gretchen Kalonji
Department of Materials Science
and Engineering
University of Washington
Seattle, WA 98195

Dr. Cynthia D. Park
Upward Bound/Talent Search
San Diego State University
San Diego, CA 92182

Dr. T. Scott Little
College of Science &
Mathematics
University of South Carolina
Columbia, SC 29208

BEST COPY AVAILABLE

Summer Science Camp Directory

"With recent decisions to adapt a new standard for college admissions in the state of Texas, it becomes more and more urgent to find ways to compensate disadvantaged children in the math and sciences fields before they enter high school.

The effect of new regulations opposing affirmative admissions and the common admissions decision together will penalize children who have had poorer teaching in less well endowed schools from competing successfully for college entrance.

The only way to battle these new barriers is to make the children competitive; and the only way to do this is by way of additional schooling (summer or Saturday sessions), upgrading teachers and teaching, and equalizing school finance.

The "Summer Science Camp Program" implements the first of these three strategies, and should certainly enjoy continued funding.

Since advanced sciences and math courses are electives in high school, children who have been well served by programs like the "Summer Science Camps" can and should be enrolling in intermediate and advanced algebra/trig, pre-calculus, calculus, chemistry, and physics."

•

Dr. Sheila Tobias,

Long term Research and Writing Associate on "Neglected Issues in Sciences Education" for the Research Corporation of the Foundation for the Advancement of Sciences, Visiting Lecture in Education at the Claremont School of Education in California

BEST COPY AVAILABLE

NATIONAL SCIENCE FOUNDATION

DR. NEAL LANE
Director
4201 Wilson Boulevard
Arlington, Virginia 22230

DR. JOSEPH BORDOGNA
Acting Deputy Director
Office of the Director
4201 Wilson Boulevard
Arlington, Virginia 22230

DR. LUTHER S. WILLIAMS
Assistant Director
Directorate for Education and Human Resources
4201 Wilson Boulevard
Arlington, Virginia 22230

DR. WANDA WARD
Staff Associate
Directorate for Education and Human Resources
Office of the Assistant Director
4201 Wilson Boulevard
Arlington, Virginia 22230

DR. ROOSEVELT CALBERT
Division Director
Division of Human Resource Development
4201 Wilson Boulevard
Arlington, Virginia 22230

DR. BETTY RUTH JONES
Senior Program Director
Precollege Programs
Division of Human Resource Development
4201 Wilson Boulevard
Arlington, VA 22230

DR. COSTELLO L. BROWN
Associate Dean of Graduate Research
California State University at Los Angeles
515 State University Drive
Administrative Building
Los Angeles, CA 90032

ALABAMA, SSC **1994**
Michael J. Froning
ASGA Math/Science Dept.
Alabama School of Fine Arts
Birmingham, Alabama 35203
Phone: (205) 328-3143
Fax: (205) 328-0337

ALABAMA, SSC **1992**
Jerry R. Shipman
Alabama A&M University
Dept. of Mathematics
Normal, Alabama 35762
Phone: (205) 851-5316
Fax: (205) 851-5931

ALABAMA, SSC **1995**
Arthur L. Bacon
Talladega College
Talladega, Alabama 35160
Phone: (205) 362-5152
Fax: (205) 362-1090

ALASKA, SSC **1993**
Edna Lamebull
Anchorage School District
Indian Education Program
P. O. Box 196614
Anchorage, Alaska 99519-6614
Phone: (907) 333-9561
Fax: (907) 269-2311

ALASKA, SSC **1992**
(University of Alaska at Fairbanks)
Paul J. Polechla, Jr.
Museum of Southwestern Biology
Div. of Mammals
University of New Mexico
Albuquerque, NM 87131-1091

ALASKA, SSC **1995**
Annie Calkins
Curriculum & Evaluation
Juneau School District
Juneau, Alaska 99801
Phone: (907) 463-1700
Fax: (907) 463-1712

ARKANSAS, SSC **1995**
Luke K. Elliott
Meadowcreek Science Institute
Fox, Arkansas 72051
Phone: (501) 363-4500
Fax: (501) 363-4578

ARKANSAS, SSC **1994**
Marian Douglas
Dept. of Chemistry
University of Arkansas
Little Rock, Arkansas 72204-1099
Phone: (501) 569-8826
Fax: (501) 569-8338

CALIFORNIA, SSC **1993**
Blas Guerrero
College of Engineering
Center for Underrepresented Engineering Students
MESA
University of California - Berkeley
Berkeley, California 94720
Phone: (510) 642-2041
Fax: (510) 643-5600

CALIFORNIA, SSC **1995**
Al Jackson/Gail Hildebrand
Recreation & Parks Management
California State University at Chico
Chico, CA 95929-0870
Phone: (916) 893-4809
Fax: (916) 898-6804

CALIFORNIA, SSC **1992**
Eunice Krinsky/Haldon L. Anderson
Dept. of Mathematics
California State University at Dominguez Hills
Carson, CA 90747
Phone: (310) 516-3378

CALIFORNIA, SSC **1993**
B. Samuel Tannenbaum/
Linda Dell'Osso
Harvey Mudd College - MESA
301 E. 12th Street
Claremont, California 91711-5990
Phone: (909) 621-8240
Fax: (909) 621-8360

CALIFORNIA, SSC **1994**
Elden K. Shaw/Juanita Muniz Torres
California State University at Fresno
Fresno, CA 93740-0094
Phone: (209) 278-2500
Fax: (209) 278-2976

CALIFORNIA, SSC 1994
Charlie Harper
Dept. of Physics
California State University at Hayward
Hayward, CA 94542
Phone: (510) 885-3401
Fax: (510) 885-4803

CALIFORNIA, SSC 1995
Luis P. Villarreal
Biological Sciences Program
University of California at Irvine
Irvine, CA 92717-1450
Phone: (714) 824-6499
Fax: (714) 824-3048

CALIFORNIA, SSC 1994
Dean Gilbert
Office of Curriculum & Instructional Resources
Long Beach Unified School District
Long Beach, CA 90807
Phone: (310) 997-8000
Fax: (310) 426-8448

CALIFORNIA, SSC 1995
Linda Robertson
Center for Underrepresented Engineering Students, School of Engineering & Applied Science
University of California at Los Angeles
Los Angeles, CA 90024-1600
Phone: (310) 206-6493
Fax: (310) 825-3908

CALIFORNIA, SSC 1994
Jewel P. Cobb
The ACCESS Center
California State University at Los Angeles
Los Angeles, CA 90032
Phone: (213) 343-5173
Fax: (213) 343-6418

CALIFORNIA, SSC 1995
Mary R. Blanding
Dept. of Academic Affairs
Drew University of Medicine & Science
Los Angeles, CA 90059
Phone: (213) 563-4926
Fax: (213) 563-1953

CALIFORNIA, SSC 1993
Debra Polak
East Bay Consortium of Education
Oakland, CA 94606
Phone: (510) 836-8367
Fax: (510) 836-8601

CALIFORNIA, SSC 1994
James Harold
Engineering/Computer Science MESA
California State University at Sacramento
Sacramento, CA 95825
Phone: (916) 923-0844
Fax: (916) 923-1206

CALIFORNIA, SSC 1992
Teresa E. Pagaling
California State University at Sacramento
Sacramento, CA 95819-2605
Phone & Fax: (805) 686-1416

CALIFORNIA, SSC 1993
Cynthia Park
San Diego State University
Upward Bound Program
5178 College Avenue
San Diego, California 92182-1104
Phone: (619) 594-8626
Fax: (619) 594-8915

CALIFORNIA, SSC 1992
James C. Kelley/Julia Wong
School of Science
San Francisco State University
San Francisco, California 94132
Phone: (415) 338-7090
Fax: (415) 338-2493

CALIFORNIA, SSC 1994
(Stanislaus County Office of Education)
Reyes Quezada
Dept. of Education
University of Redlands
Redlands, CA 92373-0999
Phone: (909) 335-4010
Fax: (909) 335-5204

CALIFORNIA, SSC 1992
Carolyn R. Mahoney/
Maureen Dupont
College of Arts & Sciences
California State University at San Marcos
San Marcos, California 92096
Phone: (619) 750-4122
Fax: (619) 750-4030

CALIFORNIA, SSC 1995
Tamala Brown
University of California
Santa Cruz, CA 95064
Phone: (408) 459-5007
Fax: (408) 459-3070
e-mail: tammib@cats.ucsc.edu

COLORADO, SSC 1994
Cathy Abeita
American Indian Science & Engineering Society
1630 30th St., Suite 301
Boulder, Colorado 80301-1014
Phone: (303) 939-0023
Fax: (303) 939-8150

COLORADO, SSC 1995
Jim Giulianelli
Chemistry Department
Regis University
Denver, Colorado 80221-1099
Phone: (303) 458-4046
Fax: (303) 458-4921

CONNECTICUT, SSC 1995
Carol Kasper
Schooner, Inc.
New Haven, Connecticut 06519
Phone: (203) 865-1737
Fax: (203) 624-8816

CONNECTICUT, SSC 1992 & 1996
Beverly Hunter Daniel/
Glenn A. Cassis
Discovering the Powers of Mathematics, Science, and Engineering
West Hartford, Connecticut 06119
Phone: (860) 769-5281
Fax: (203) 523-1614

DELAWARE, SSC 1995
Gustav Ofosu
Biology Dept.
Delaware State University
Dover, Delaware 19901
Phone: (302) 739-5102
Fax: (302) 739-3567

DISTRICT OF COLUMBIA, SSC 1992
Winston R. Coleman
College of Professional Studies
Science & Engineering Center
University of the District of Columbia
Washington, DC 20008
Phone: (202) 274-6285/87
Fax: (202) 274-5000

FLORIDA, SSC 1995
Curtis Jefferson
Math Dept.
Santa Fe Community College
Gainesville, Florida 32606
Phone: (352) 395-5000
Fax: (352) 395-5581

FLORIDA, SSC 1993
Judy B. Chen/Alberto Ramirez
Dept. of Education
Miami Museum of Science, Inc.
Miami, Florida 33129
Phone: (305) 854-4247, ext.257/254
Fax: (305) 285-5801

FLORIDA, SSC 1995
Edwin McClintock
Specializations/College of Education
Florida International University
Miami, Florida 33199
Phone: (305) 348-2087
Fax: (305) 348-2086

GEORGIA, SSC 1994
Carolyn Keys
Dept. of Middle/Secondary Education
& Instructional Technology
Georgia State University
Atlanta, Georgia 30303-3083
Phone: (404) 651-2700
Fax: (404) 651-2546

GEORGIA, SSC 1992 & 1996
Melvin R. Webb
Dept. of Biology
Clark Atlanta University
Atlanta, Georgia 30314
Phone: (404) 880-8000
Fax: (404) 880-6843

GEORGIA, SSC 1993
Army Lester, III
Dept. of Biology
Kennesaw State College
Marietta, Georgia 30144
Phone: (770) 423-6164
Fax: (770) 423-6625

ILLINOIS, SSC 1992 & 1996
Dale F. Reed
Dept. of Math
Loyola University Chicago
Chicago, Illinois 60626
Phone: (312) 413-9478
Fax: (312) 508-3514

ILLINOIS, SSC 1994
Lynn Goodnight
Northwestern University
Evanston, Illinois 60208
Phone: (847) 491-3026
Fax: (847) 467-1057

INDIANA, SSC 1992 & 1996
Edward S. Pierson
Dept. of Engineering
Purdue University-Calumet
Hammond, Indiana 46323-2094
Phone: (219) 989-2472
Fax: (219) 989-2898

INDIANA, SSC 1993
Regina Todd-Hicks
Purdue University
West Lafayette, Indiana 47907
Phone: (317) 494-1760
Fax: (317) 494-1736

KENTUCKY, SSC 1993
Howard K. Hardin
Jefferson County Public Schools
Dept. of Education Assessment
VanHoose Education center
3332 Newburg Rd.
Louisville, Kentucky 40218
Phone: (502) 485-3551
Fax: (502) 485-3821

MARYLAND, SSC 1993
Sylvia James
National Aquarium in Baltimore
Education & Interpretation
Baltimore, Maryland 21202-3194
Phone: (410) 576-3800
Fax: (410) 576-8238

MASSACHUSETTS, SSC 1994
Joyce Newhouse
Mass PEP, Inc.
Boston, Massachusetts 02115
Phone: (617) 427-7227
Fax: (617) 442-3982

MASSACHUSETTS, SSC 1993
Meg Watson/Michael Fields, French
River Education Center, Inc.
Dorchester, Massachusetts 02125
Phone: (617) 287-2183
Fax: (617) 635-8750

MASSACHUSETTS, SSC 1995
Aldo Crugnola/Janice Bryant
College of Engineering
University of Massachusetts at Lowell
Lowell, Massachusetts 01854
Phone: (508) 934-2575
Fax: (508) 934-3007

MASSACHUSETTS, SSC 1994
Robert Wallace
Dept. of Natural Sciences
Bentley College
Waltham, Massachusetts 02154-4705
Phone: (617) 891-2937
Fax: (617) 891-3410

MICHIGAN, SSC 1993
Arthur Haman, University of Detroit
Mercy College/Kenneth Hill/
Kate Callas
Detroit Area Pre-College Engineering
Program
Detroit, Michigan 48202
Phone: (313) 881-7611
Fax: (313) 831-5633

MICHIGAN, SSC 1993
Irvin E. Vance
Math Dept./Black Child and Family Inst.
Michigan State University
East Lansing, Michigan 48824-1027
Phone: (517) 353-4693
Fax: (517) 432-1562

MICHIGAN, SSC 1995
Joanne Caniglia
Mathematics Dept.
Eastern Michigan University
Ypsilanti, Michigan 48197
Phone: (313) 487-3448
Fax: (313) 481-0650

MINNESOTA, SSC 1992
Bruce Munson
Dept. of Education
University of Minnesota at Duluth
Duluth, Minnesota 55812-2496
Phone: (218) 726-6324
Fax: (218) 726-7073

MINNESOTA, SSC 1994
Kit Wilhite
Education Division
Science Museum of Minnesota
St. Paul, Minnesota 55101
Phone: (612) 221-9488
Fax: (612) 221-4777

MISSISSIPPI, SSC 1992 & 1996
William L. White
Jackson State University
School of Science & Technology
Jackson, Mississippi 39217
Phone: (601) 972-2153
Fax: (601) 968-2058

MISSISSIPPI, SSC 1995
William J. Sumrall
Dept. of Curriculum & Instruction
Mississippi State University
Mississippi State, Mississippi 39762
Phone: (601) 325-3747
Fax: (601) 325-8784

MISSOURI, SSC 1995
Farella Shaka
Physics & Astronomy Dept.
Southwest Missouri State University
Springfield, Missouri 65804
Phone: (417) 836-5131
Fax: (417) 836-6934

MISSOURI, SSC 1994
Lloyd Richardson
School of Education
Center for Excellence in Urban Education
University of Missouri at St. Louis
St. Louis, MO 63121-4499
Phone: (314) 516-6558
Fax: (314) 516-5859

NEBRASKA, SSC 1994
Jimmi H. Smith, III
Office of Multi-Cultural Affairs Administration
University of Nebraska at Lincoln
Lincoln, Nebraska 68588-0498
Phone: (402) 472-2027
Fax: (402) 472-9338

NEW JERSEY, SSC 1994
Lambert B. Jackson
EOF Program
Rutgers University
Camden, New Jersey 08102
Phone: (609) 225-6107
Fax: (609) 225-6139

NEW JERSEY, SSC 1993
Louis A. Iozzi
Rutgers University & Cook College
Center for Environmental and Agricultural Education
New Brunswick, New Jersey 08903-0231
Phone: (908) 932-9164/7786
Fax: (908) 932-1519

NEW JERSEY, SSC 1993
Ophelia Gona
Dept. of Anatomy
UMDNJ New Jersey Medical School
Newark, New Jersey 07103-2714
Phone: (201) 982-5245
Fax: (201) 982-7489

NEW JERSEY, SSC 1992
Howard S. Kimmel
Precollege Programs
University Heights
New Jersey Institute of Technology
Newark, New Jersey 07102-1982
Phone: (201) 596-3550/3679
Fax: (201) 642-1847

NEW MEXICO, SSC 1993
Susan McGuire
New Mexico Museum of Natural History & Science
Public Programs/Education
Albuquerque, New Mexico 87104
Phone: (505) 841-2845
Fax: (505) 841-8866

NEW YORK, SSC 1995
Winston Smith/Edward Millman
Curriculum & Instruction Dept.
Community School District #23
Brooklyn, New York 11233
Phone: (718) 270-8663
Fax: (718) 270-8666

NEW YORK, SSC 1992
Michael A. Johnson/Dennis Brown
Science Skills Center, Inc.
Brooklyn, New York 11238
Phone: (718) 636-6213
Fax: (718) 636-9685

NEW YORK, SSC 1992
Awilda Orta
Division of Planning Research
Ctr. for Pre-College Initiatives
Eugenio Maria de Hostos Community College
Bronx, New York 10451
Phone: (718) 518-4444
Fax: (718) 518-4246

NEW YORK, SSC 1995
Nancy Sosnow
Education Dept.
Bronx Zoo/Wildlife Conservation Park
Bronx, New York 10460-1099
Phone: (718) 220-5114
Fax: (718) 733-4460

NEW YORK, SSC 1992 & 1996
Laila Denoya
Dept. of Education
SUNY at Fredonia
Fredonia, New York 14063
Phone: (716) 673-3521
Fax: (716) 673-3234

NEW YORK, SSC 1994
Jack Schlein
Dept. of Natural Sciences
CUNY York College
Jamaica, New York 11451
Phone: 718) 262-2716
Fax: (718) 262-2652

NEW YORK, SSC 1994
Annette Saturnelli
Newburgh Enlarged City School District
Newburgh, New York 12550
Phone: (914) 563-7462
Fax: (914) 563-7493

NEW YORK, SCC 1993
Lily E. Christ
John Jay College of Criminal Justice
The City University of New York
New York, New York 10019
Phone: (212) 237-8926
Fax: (212) 237-8777

NEW YORK, SSC 1993
Maureen A. Hornung
Liberty Partnership Program
Bank Street College
New York, New York 10025
Phone: (212) 875-4506
Fax: (212) 875-4547

NEW YORK, SSC 1994
Berkowitz/Posamentier
Secondary Education
CUNY Research Fdn.
New York, New York 10031
Phone: (212) 650-5471
Fax: (212) 650-6970

NEW YORK, SSC 1992 & 1996
Henry Teoh
Dept. of Chemistry & Physics
SUNY College at Old Westbury
Old Westbury, New York 11568
Phone: (516) 876-2706
Fax: (516) 876-2758

NEW YORK, SSC 1994
Denise D. White
Office of Native American Affairs
SUNY Potsdam
Potsdam, New York 13676
Phone: (315) 267-2584
Fax: (315) 267-2342

NEW YORK, SSC 1992
Robert Ellson
Dept. of Mechanical Engineering
Rochester Institute of Technology
P. O. Box 9887
Rochester, New York 14623-5604
Phone: (716) 475-2162
Fax: (716) 475-7710

NEW YORK, SSC 1992
Thomas T. Liao/Edith Steinfeld
Dept. of Technology & Society
SUNY at Stony Brook
Stony Brook, New York 11794-2250
Phone: (516) 632-8761/8716
Fax: (516) 632-7809

NEW YORK, SSC 1993
Mark Smith
Rensselaer Polytechnic Inst.
Office of Minority Student Affairs
Troy, New York 12180-3590
Phone: (518) 276-6272
Fax: (518) 276-4034

NORTH CAROLINA, SSC 1994
Benjamin Dias
Chemistry/Physics Dept.
Johnson C. Smith University
Charlotte, North Carolina 28216
Phone: (704) 378-1054
Fax: (704) 378-1213

NORTH CAROLINA, SSC 1992 & 1996
Henry A. Collins
Science/Biology Dept.
Bennett College
Greensboro, North Carolina 27420
Phone: (910) 273-4431
Fax: (910) 273-8693

NORTH CAROLINA, SSC 1994
Allan Goldfarb
Dept. of Exercise & Sport Science
University of North Carolina
Greensboro, North Carolina 27412-5001
Phone: (910) 334-5308
Fax: (910) 334-3238

NORTH CAROLINA, SSC 1993
Joseph Kishton
Psychology Dept.
University of North Carolina
Wilmington, North Carolina
28403-3297
Phone: (910) 395-3370
Fax: (910) 395-3863

NORTH CAROLINA, SSC 1995
Shirley Turnage
Administration
Roanoke River Valley Consortium
Windsor, North Carolina 27983
Phone: (919) 794-3173
Fax: (919) 794-9727

OHIO, SSC 1993
Iris DeLoach Johnson/Anita
Roychoudhury/G. Nathan Carnes
Teacher Education Dept.
Miami University at Oxford
Oxford, Ohio 45056
Phone: (513) 529-6437
Fax: (513) 529-4931

OHIO, SSC 1993
Helen C. Cooks
Toledo Excel & PREP/TECH
University of Toledo
Toledo, Ohio 43606-3390
Phone: (419) 530-3895
Fax: (419) 530-3902

OKLAHOMA, SSC 1993
Alan R. Harker/Kim Burnham
Botany/Microbiology Dept.
Oklahoma State University
Stillwater Oklahoma 74078
Phone: (405) 744-6243
Fax: (405) 744-6790

PENNSYLVANIA, SSC 1993
John C. Mertz
Dept. of Biology
Delaware Valley College
Doylestown, Pennsylvania 18901-2607
Phone: (215) 345-1500
Fax: (215) 345-5277

PENNSYLVANIA, SSC 1994
Lynnette Smith
Office of Curriculum Support,
Philadelphia School District
Philadelphia, Pennsylvania19103
Phone: 215) 299-7797
Fax: (215) 299-7795

PUERTO RICO, SSC 1995
Alvaro LeCompte
Math/Physical Science Dept.
Inter American University
San German, Puerto Rico 00638
Phone: (809) 264-1912, ext. 7427
Fax: (809) 892-6350

RHODE ISLAND, SSC 1992
William J. Ohley
Dept. of Electrical Engineering
University of Rhode Island
Kingston, Rhode Island 02881
Phone: (401) 874-2505/ext. 2506
Fax: (401) 874-2186

SOUTH CAROLINA, SSC 1994
Herman Green
The Houston Center for the Study
of Black Experience Affecting
Higher Education
Clemson University
Clemson, South Carolina 29634-5185
Phone: (804) 656-0313
Fax: (803) 656-0314

SOUTH CAROLINA, SSC 1995
Juanita S. Scott
Biology & Physical Science
Benedict College
Columbia, South Carolina 29204
Phone: (803) 253-5230/5265
Fax: (803) 253-5336

SOUTH CAROLINA, SSC 1993
Timothy S. Little
College of Science & Mathematics
University of South Carolina
Columbia, South Carolina 29208
Phone: (803) 777-0313
Fax: (803) 777-0314

SOUTH CAROLINA, SSC 1994
Sylvester N. Ekpenuma
Claflin College
Orangeburg, South Carolina 29115
Phone: (803) 535-5254
Fax: (803) 531-2860

SOUTH DAKOTA, SSC 1993
Phillip Huebner
Scientific Knowledge for
Indian Learning & Leadership
(Skill) Program
South Dakota School of Mines
and Technology
Rapid City, South Dakota
57701-3995
Phone: (605) 394-1828
Fax: (605) 394-6131

TENNESSEE, SSC 1994
Leroy Moore/Ida Mosby
Office of Health Career Programs
University of Tennessee
Memphis, Tennessee 38163
Phone: (901) 448-6840
Fax: (901) 448-72555

TENNESSEE, SSC 1992
Peggy King
Science/Engineering Education Div.
Oak Ridge Ass. Universities
Oak Ridge, Tennessee 37831-0117
Phone: (615) 576-6220
Fax: (615) 576-0202

TEXAS, SSC 1994
(University of Texas Pan American)
Nick Kiritsis
Austin, Texas 78731-3074
Phone & Fax: (512) 343-0393

TEXAS, SSC 1992
Robert R. Galvan
Office of the Vice President for
Administration & Public Affairs
University of Texas at Austin
Austin, Texas 78713-7578
Phone: (512) 475-6064
Fax: (512) 471-8569

TEXAS, SSC 1995
Julia Hedden
Girls Inc. of Metropolitan Dallas
Dallas, Texas 75235
Phone: (214) 654-4530
Fax: (214) 350-8115

TEXAS, SSC 1993
Lela F. Jackson
The Science Place in Fair Park
Southwest Museum of Science
and Technology
Dallas, Texas 75315-1469
Phone: (214) 428-5555
Fax: (214) 428-2033

TEXAS, SSC 1994
Robert Houston
Dept. Texas Center for University
School Partnerships
University of Houston
Houston, Texas 77204-5874
Phone: (713) 743-5021
Fax: (713) 743-4989

TEXAS, SSC 1993
Glenn Longley
Southwest Texas State
University/Edwards Aquifer
Research & Data Center
San Marcos, Texas 78666-4616
Phone: (512) 245-2329
Fax: (512) 245-2669

VIRGINIA, SSC 1992
(Hampton University)
Ann Trahanovsky-Orletsky
Math. Dept.–Western Illinois University
Macomb, Illinois 61455
Phone: (309) 298-1383

VIRGINIA, SSC 1995
Katura Carey-Harvey
CHROME
Old Dominion University
Norfolk, Virginia 23501-1394
Phone: (804) 683-6032
Fax: (804) 683-6031

VIRGINIA, SSC 1995
Willie Mae Beamon
Math Dept.
Norfolk State University
Norfolk, Virginia 23504
Phone: (804) 683-8820
Fax: (804) 683-8427

WASHINGTON, SSC 1992
Kathleen Sullivan
Dept. of Mathematics
Seattle University
Seattle, Washington 98122-4460
Phone: (206) 296-5930
Fax: (206) 296-2179

WASHINGTON, SSC 1994
Herb Bryce
Dept. of Science & Math
Seattle Central Community College
Seattle, Washington 98122
Phone: (206) 587-6921
Fax: (206) 344-4390

WASHINGTON, SSC 1992
Robin Adams/Gretchen Kalonji
Dept. of Materials Science &
Engineering
University of Washington
Seattle, Washington 98195
Phone: (206) 543-2600
Fax: (206) 685-3100

WISCONSIN, SSC 1995
Jerilyn Grignon
Administration
College of the Menominee Nation
Keshena, Wisconsin 54135
Phone: (715) 799-5606
Fax: (715) 799-1326

WISCONSIN, SSC 1992 & 1996
Susan Schneider/Christine J. Faltz
Marquette University
Dept. of Electrical and Computer
Engineering
Milwaukee, Wisconsin 53201-1881
Phone: (414) 288-7178
Fax: (414) 288-5579

"...We were able
to learn how to work
with other people, who have
different ideas and backgrounds,
which is essential to be able to
work in tomorrow's world.
Today, most children
spend their time watching
television, not envisioning or
even thinking as they sit and
do nothing but breathe.
Children of today
must learn hands-on skills
and be able to use those skills
to make tomorrow a better
place to live for everyone.
We are tomorrow's leaders,
and if we are ill-prepared,
then the world may fall apart
at our fingertips."

•

Paul Biehl,

Participant at

Harvey Mudd College in California

Summer Science Camp

BEST COPY AVAILABLE

NATIONAL SCIENCE FOUNDATION

4201 Wilson Boulevard
Arlington, Virginia 22230

BEST COPY AVAILABLE